35th Year JUNE, 1951

RUBBER AGE

SPEEDY and SAFE

TELLURAC

acceleration for

BUTYL

TUBE AND INSULATION COMPOUNDS

R. T. VANDERBILT CO. INC.

230 Park Avenue, New York 17, N. Y.

You can rely on

Du Pont THERMOFLEX A

for unexcelled flex-cracking protection

If your product needs the best possible flex-cracking protection, you'll take no chances if you use Du Pont Thermoflex A. This antioxidant is time-tested. For over fifteen years it has been the accepted standard of excellence among all flex-resistant antioxidants. This reputation is based on performance. And the results shown in the accompanying data are typical of this performance.

Two natural rubber stocks, one with and one without Thermoflex A, were compared for resistance to flex-cracking. The cured specimens were tested on the Du Pont Flexing Machine according to Method C of the Standard Method of Dynamic Testing for Cracking of Rubber Products (ASTM D 430-40). Degree of cracking is expressed in units from 0 to 10. A sample rates 10 when it cracks completely across the grooves in the sample. Zero rating indicates no cracking. Note that the unprotected stock failed completely in 64 hours. The stock with Thermoflex A, on the other hand, showed only slight evidence of cracking after 136 hours.

TEST RECIPES

Smoked Sheets	100	100
Zinc Oxide	5	5
Channel Black	50	50
Stearic Acid	3	3
Pine Tar	1.5	1.5
Sulfur	3	3
Zenite B	1.25	1.25
Thermoflex A	1	-

(Specimens cured 60 min. at 274° F.)

FLEX RATING

Flexing Time		
64 hrs.	0	10
136 hrs.	2.5	Discontinued at 64 hours

Not only is Thermoflex A outstanding for flex-cracking resistance, but it's also excellent for protection against normal aging deterioration. It provides very good heat resistance, it's extremely easy to disperse and it does not affect cure.

So try Thermoflex A if you aren't already using it. Samples are available. For more information contact your district office or write to the address below.

BRANCH OFFICES:

Akron, Ohio	40 E. Buchtel Ave.	HEmlock 3161
Boston, Mass.	140 Federal St.	HAncock 1711
Chicago, Ill.	7 S. Dearborn St.	ANdover 3-7000
Los Angeles, Cal.	845 E. 60th St.	ADams 3-5206
New York, N. Y.	40 Worth St.	COrtlandt 7-3966

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

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News about

B. F. Goodrich Chemical Company ***raw materials***

for improved, lower-cost rubber compounding—use

Good-rite

*REG. U. S. PAT. OFF.

RESIN 50

WITH this easy-processing reinforcing agent, you can make important savings on your rubber-compounding costs. Finished products will be improved, too.

Just see what Good-rite Resin 50 does! It provides a new compounding approach to hardness problems. For example, it's a simple means of filling in the gap between soft rubber compounds and ebonites.

It saves time by eliminating masterbatching. It gives rubber compounds better flex life, higher elongation, improved abrasion resistance. Compounds are more easily handled because Resin 50 acts as a plasticizer at processing temperatures.

For extruded shapes such as gaskets, tubing, coving, etc., particularly on hard compounds, Resin 50 provides improved surface smoothness and superior processing characteristics in the extruder.

Made as a white, free-flowing powder, Good-rite Resin 50 can be compounded in a wide range of colors. It may help you improve your rubber compounding, save you money, too. Under present conditions, demand for Good-rite Resin 50 exceeds supply. However, limited quantities are available for development work. For technical bulletins and advice, write Dept. CA-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U. S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

If you want to keep your tensile high
Philblack* O *is the guy to buy!*

Hercules! Atlas! Look to your laurels! Strongman Philblack O puts sinewy muscles in rubber compounds.

Yes, this tough, sturdy **HAF** (High Abrasion Furnace) black imparts remarkable stress-strain properties to V-belts, conveyors and other mechanical goods, along with exceptional abrasion resistance.

When your product needs plenty of stamina, specify Philblack O. Our expert technical representatives will gladly discuss proper compounding procedures and recipes for optimum results in GR-S, low temperature polymers, and natural rubber.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING · AKRON 8, OHIO

PHILBLACK EXPORT SALES DIVISION • 80 BROADWAY • NEW YORK 5, N. Y.

Philblack A and Philblack O are manufactured at Borger, Texas.

Warehouses in Akron, Boston, Chicago and Trenton. West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

Phillips 66

* A Trademark

EASIER PROCESSING, *better physical properties and excellent combination of oil and chemical resistance led to the selection of* CHEMIGUM *50 N4NS in the stock from which these pipe fittings were molded to close dimensional tolerances.*

USE PROVED *Products*

You can make better chemically-resistant pipe

with CHEMIGUM

Photos courtesy of The Luzerne Rubber Co.

Makers of hard rubber chemical-resistant piping have found that CHEMIGUM — Goodyear's nitrile type synthetic elastomer— is an ideal material. CHEMIGUM has better oil resistance than either natural rubber or other types of synthetics, better physical properties and good moldability.

You'll find that CHEMIGUM rubbers are outstanding in all these characteristics:

Easier Processability
Better Physical Properties
Excellent Chemical Resistance
Excellent Oil Resistance
Excellent Moldability
Fine, Glossy Finish

CHEMIGUM is available in three types — N3NS, with greatest oil and solvent resistance because of its high acrylonitrile content; 30 N4NS, with the lowest Mooney plasticity of any nitrile rubber; and 50 N4NS which is slightly tougher, and best suited for molded applications.

Current uses of the CHEMIGUM rubbers include gasoline hose; oil-resistant shoe soles; hard packing compounds; oil-resistant automotive parts; a wide range of molded and extruded items; and adhesives of several types. Although all nitrile rubbers are currently in short supply, you can find high-potential uses for CHEMIGUM in the future by sending today for samples for evaluation and full technical data to:

Goodyear, Chemical Division, Akron 16, Ohio

GOODYEAR

Chemigum—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

ACTIVATOR NEWS

HORSE HEAD PRODUCTS

A supplement to THE ACTIVATOR—the house organ issued by The New Jersey Zinc Company for over 15 years to aid the Rubber Industry in its use of Zinc Oxide.

A CUSTOMER TELLS US— "PROTOX ZINC OXIDE CUTS POWER COSTS"

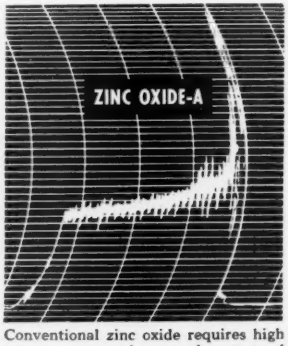
This customer explains that, by simply replacing conventional zinc oxide with Protox-166* in zinc masterbatching, he dropped Banbury power costs in these *2 ways:*

1. Total power use per batch is noticeably lower.
2. Power peaks are eliminated – thus reducing premium payments for excess plant loads.

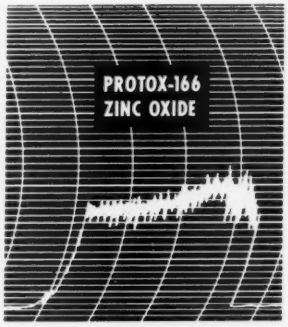
He found, too, that Protox-166 dispersed more completely and imparted faster, smoother tubing and calendering.

The accompanying power consumption charts of masterbatches made on our laboratory Banbury confirm this customer's results.

** U. S. Patents 2,303,329 and 2,303,330.*



Conventional zinc oxide requires high power consumption at the start of masterbatching (at right) when rubber is replacing gases adsorbed on the pigment surface.



Protox-166 zinc oxide cuts power costs because its zinc propionate coating provides easy wetting by rubber, improved dispersion, and better tubing and calendering.

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

... most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

HORSE HEAD PRODUCTS

When it's PELLETEX you KNOW...

Bead Stock is on for Tire Life

PELLETEX®

Yes, sir, with PELLETEX in the compound, the bead wears better and lasts as long as the tire itself. Processing is easier, extruding uninterrupted, and bead compounds far more effective. High loadings are possible at low volume cost, as well as accelerator savings — which only proves that there's a BEST BLACK for every job, and for bead stocks, PELLETEX is IT!

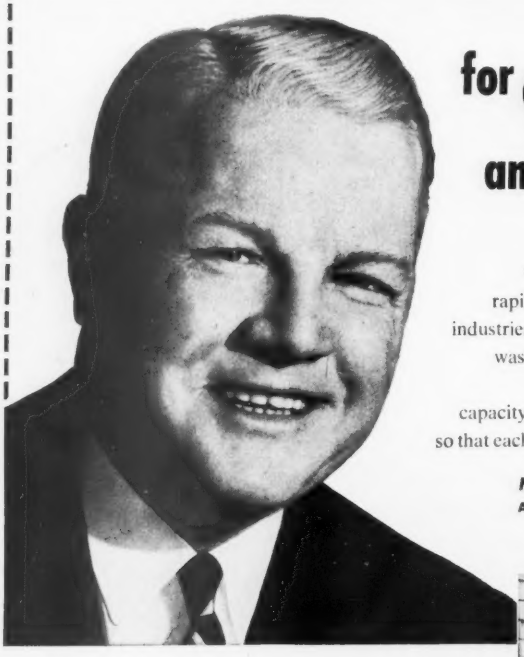
PELLETEX high resilience, good abrasion resistance, and splendid aging properties make it first choice among bead stock manufacturers all over the world. Compounders demand it, because it's grit-free — gives uniform processing every time. Tire manufacturers depend on PELLETEX bead compounds to prevent tire stretching, to simplify mounting, to hold the tire securely to the wheel-rim and to give the outstanding service motorists need and want.

The GENERAL ATLAS Carbon Co.

CABOT

77 FRANKLIN STREET, BOSTON 10, MASS.

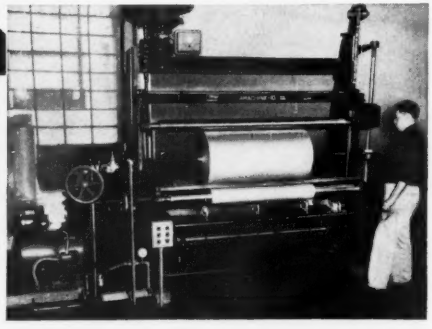
Herron Bros. & Meyer Inc., New York and Akron • Herron & Meyer of Chicago, Chicago
Raw Materials Company, Boston • H. N. Richards Company, Trenton
The B. E. Dougherty Company, Los Angeles and San Francisco • Delacour-Gorrie Limited, Toronto



for *extra* capacity and *extra* precision!

"EVERYONE KNOWS that production problems are rapidly mounting in the paper making and printing industries. Now, more than ever before, we can't afford to waste either time or materials. The recent addition of new equipment to our plant provides that *extra* capacity which is needed to keep a step ahead of the pace—so that each job can be handled with *extra* care to avoid waste."

Mr. Arthur G. Nelson, President
A. G. Nelson Paper Co., Inc., New York, N. Y.



The Camachine Type 10 Model 04 slitter rewinder recently installed at A. G. Nelson Company is equipped with: Camachine 1B-PMR pneumatic mill-roll stand; electric riding roll lift; and Pneucut® patented pneumatic slitter units. Handles 72" rolls at 2000 feet per minute. Rewound diameters to 40".

®Trade name reg. U. S. Pat. Off.

NELSON's reputation has been built through more than thirty years of service in supplying accurately rewound paper rolls and sheets for the printing industry of Metropolitan New York. The A. G. Nelson plant, completely equipped with modern slitting, rewinding and sheeting equipment, also serves as a finishing room for paper mills.

High-speed web-fed printing presses call for absolutely true slitting and rewinding to assure the uniform web tension which minimizes web breaks, and to provide more accurate lengthwise and sidewise register on the travelling web. Because they are backed by more than thirty years of know-how in roll production it is not surprising to find the A. G. Nelson Company plant equipped exclusively with *Camachine* slitters and rewinders.

Over the years *Camachine* has proved to be the *one* outstanding name in roll production equipment . . . for rubber, textiles, plastics and other materials, as well as for paper and paper board. No matter what material you produce or convert in roll form, it will pay you to consult with *Camachine* engineers regarding faster production and improved roll quality.

Cameron Machine Co., 61 Poplar St., Brooklyn 2, N.Y.

They can depend on Camachine®

AA-258

CUTTING PAD *used to back up clicking machine shown above operated for 8 months. Close-up shows lack of effect on* PLIO-TUF *of severe impact repeated thousands of times.*

UNDER the cutting knife of a clicking machine, this PLIO-TUF pad you see has been taking constant blows from the sharp blade for over 8 months—6 three-shift days a week. Yet after many thousands of cuts, the pad shows relatively little wear and no evidence of chipping or dusting. Even the few signs of this hard service can be easily removed, because the thermoplastic PLIO-TUF can be resurfaced by a simple re-pressing operation.

PLIO-TUF can be compounded from Goodyear's PLIOLITE S-6 or S-6C and the rubber of your choice. And you'll find that PLIO-TUF gives you all these advantages:

Hardness and rigidity — can be machined or molded to shape • Impact resistance—will not break under repeated impacts • Non-chipping, non-dusting—insures clean surfaces • Resists moisture—will retain shape desired • Light color • Thermoplasticity • Light weight • Chemically resistant • Flexibility of physical characteristics

PLIO-TUF is in use in protective equipment, textile spool ends, chemical pipe and container manufacture, carrying cases and tote boxes, in sporting goods—wherever impact resistance and other properties above are important. It will fit into your production plans, too.

Although the PLIOLITE S-6 resins are currently in short supply, start your laboratory work now as normal availability will return.

Write today for full details and samples for your own appraisal to:

Goodyear, Chemical Division, Akron 16, Ohio

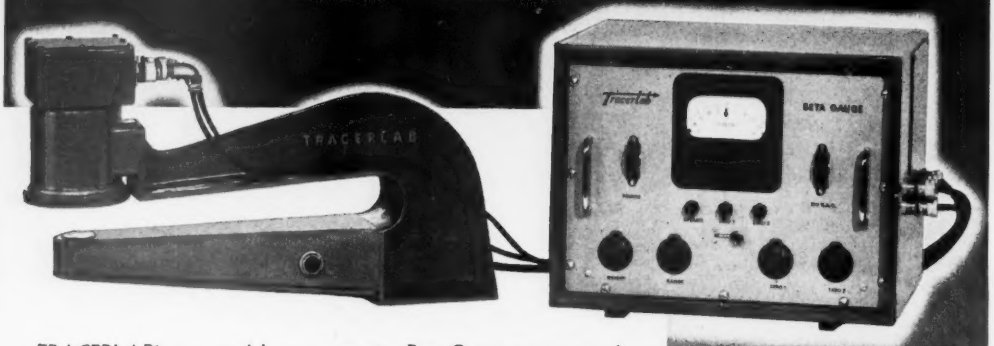
GOODYEAR

Plio-Tuf, Pliolite—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

THICKNESS CONTROL A PROBLEM?

Tracerlab Beta Gauges

CUT COSTS—IMPROVE QUALITY



TRACERLAB's new model, non-contacting Beta Gauge measures and records the weight per unit area or thickness of sheet materials. Because beta radiation is used, a high degree of accuracy and sensitivity is achieved, unaffected by variations in chemical composition of the material being gauged.

Tracerlab developed the first Beta Gauges, and the experience gained through having these instruments in successful, everyday operation in a number of diversified process industries has now been incorporated in a new and outstanding gauge. Featured are simplicity of operation, ruggedness of design and reliability of operation — all combined in an instrument that maintains Tracerlab's established leadership.

The gauge's low cost will be rapidly repaid from raw material savings resulting from closer manufacturing tolerances and faster control, plus a greater uniformity of product with its resulting advantages. A meter showing percentage variation from normal, or a meter calibrated directly in weight or thickness, is standard equipment. Where a continuous record is desired, various types of recorders are available.

For non-contacting gauging of materials accessible only from one side, Tracerlab manufactures a model which operates by measuring "back scattered" beta particles. This gauge is particularly useful in gauging rubber, paper, plastics and other materials as they pass over a calender roll. It has also proved highly effective in measuring thickness of coatings on certain substances.

For complete information, write for Bulletin BG-RA.

Tracerlab
BETA GAUGES
are NOW gauging:

CARDBOARD
•
PLASTICS
•
PAPER
•
ADHESIVE TAPE
•
SHEET METAL
•
RUBBER
•
PAPER COATINGS
•
METAL FOIL
•
PLASTIC COATINGS
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PHOTOGRAPHIC COATINGS
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LINOLEUM

Tracerlab

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NEW YORK, N. Y.
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TRACERLAB INC., 130 HIGH STREET, BOSTON 10, MASS.

DOUBLE-CHECKED ✓ CHEMICALS FOR THE RUBBER INDUSTRY

VULTAC
ALKYLPHENOL SULFIDE

Vulcanizing agent for natural rubber and synthetic elastomers. Vultac eliminates sulfur bloom normally encountered with pigment sulfur, and imparts easy processing characteristics to GR-S formulations.

The uniform vulcanization achieved through the use of the VULTACS results in GR-S and nitrile rubber stocks possessing the following superior qualities:

1. Maintenance of tensile strength and elongation upon extended cure.
2. Retention of tensile strength and elongation after severe aging.
3. Outstanding resistance to heat.
4. Outstanding resistance to flex cracking and tear, before and after aging and at elevated temperatures.

	VULTAC No. 2	VULTAC No. 3
Type Alkylphenol Sulfide	Disulfide	Disulfide
Sulfur Content	23%	28%
Color and Form	Hard Brown Resin	Hard Brown Resin
Softening Point (ASTM E28-36T)	55-65°C.	70-80°C.
Solubility	Readily soluble in all common organic solvents except the alcohols.	Readily soluble in all common organic solvents except the alcohols.
Specific Gravity 25/25°C.	1.16-1.17	1.19-1.20
Approx. Lbs. per Gallon	9.7	10.0

● 25th Anniversary ●

SHARPLES TRADE MARK CHEMICALS

Sharples Chemicals Inc.

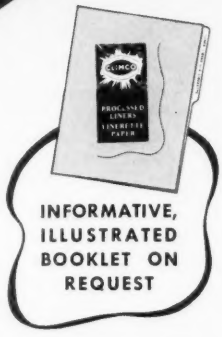
350 Fifth Ave., New York, N.Y.
80 E. Jackson Blvd., Chicago 4, Illinois
34 Cherry St., Akron 8, Ohio

"Man, am I glad our liners are CLIMCO PROCESSED!"

"Since the boss sent our liners to Cleveland Liner for processing, we've had no trouble from stock adhesions—no down time—the work moves along smoothly."

As your stock leaves the calendar, roll it into a Climco Processed Liner. You will save costly production delays by getting perfect separation at the bias cutter and cutting tables. Many other advantages are to be had through the use of Climco Liners: Horizontal storage of stocks is facilitated . . . lint and ravelings are eliminated . . . freshness and tackiness are preserved . . . gauges can be more closely maintained . . . latitude in compounding is enlarged . . . brushing and cleaning of liners are avoided and liner life is increased several times.

Let us tell you about Cleveland Liner's twenty-five years service to the rubber industry. Better yet, give Climco Processed Liners a trial in your plant.



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West Coast Representative
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Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS
Serving the Rubber Industry for 25 Years

FOR LONG-LASTING WHITENESS... BRIGHTNESS
CALCO'S

UNITANE O-220 titanium dioxide

An Anatase Type Titanium Dioxide, UNITANE O-220 is the economical pigment that assures maximum whiteness with minimum loading. It is especially recommended for producing brilliance in white and white-tinted articles.

Ask your Calco representative for full information about Calco's complete line of UNITANES. There's a type and grade to meet your needs.

Calco

AMERICAN Cyanamid COMPANY
CALCO CHEMICAL DIVISION
PIGMENT DEPARTMENT
BOUND BROOK, NEW JERSEY
Branch Offices and Warehouses in Principal Cities

Improve your vinyl plastics operations and cut costs

...with "Dutch Boy" DS-207

PATENT APPLIED FOR

...here's a co-stabilizer with a triple advantage

"Dutch Boy" Stabilizers	
PRODUCT	**USE**
TRI-BASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRI-BASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Sheeting, extrusion and molded compounds, i.e., insulated wire and vinyl phonograph records
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent film and sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	High grade insulated wire and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light
DYPHOS (Di-basic Lead Phosphite)	Excellent for heat and light in all opaque stocks, including Plastisols and Organosols
NORMASAL (Normal Lead Salicylate)	Vinyl flooring and other compounds requiring good light-stability

You use only half of one per cent, or so—*But See What You Get* with "Dutch Boy" DS-207—a co-stabilizer that speeds production, upgrades quality, and cuts costs.

DS-207 provides solid phase lubricity at all temperatures, and is highly dispersible. Thus, processing is smoother and faster, both in calendering and in molding.

DS-207, stable at temperatures nearing 600°F, imparts excellent heat- and light-stability as a co-stabilizer. Tack control is good. It also increases water- and solvent-resistance in finished products.

Let our technical staff show specifically what DS-207—and the other "Dutch Boy" chemicals—can do for you. Call on us.

Dutch Boy* CHEMICALS

*Trademarks Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY, *111 Broadway, New York 6, N. Y.*

a combination to extend and improve your compounds

CONTINENTAL AA EPC

WITCO M.R. #38
(HARD HYDROCARBON)

Whether you make natural or chemical rubber compounds—

Benefit by: Reduced Processing Costs
Lower Volume Costs
Safe Processing Stocks
Smooth Extrusions and Calendering
Less Milling, Tubing and Calender Shrinkage

Obtain: High standard, uniform products, plus increased production

Use in: Rubber Footwear, Mechanical Goods, Bicycle Tires, Wire Insulation, Window Channel, and Miscellaneous Extruded Stocks.

WITCO CHEMICAL COMPANY

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Check your requirements against these WITCO products:

CONTINENTAL A (MPC)
CONTINENTAL AA (EPC)
CONTINEX HAF
CONTINEX HMF
CONTINEX SRF
SUNOLITE

SIMPLIFY PRODUCTION

CUT COSTS

WITH PLASTISOLS

Plastisols are rapidly coming into their own as the easiest, most economical way of reducing production costs and simplifying the manufacture of supported vinyl sheeting.

Blends of "paste" resins and Barrett ELASTEX* 28-P Plasticizer or Barrett "ELASTEX" 10-P Plasticizer offer these important advantages.

1. They save manufacturing time.
2. They reduce compounding to a simple hand operation eliminating the need for expensive machinery for calendering.
3. They make the use of solvents unnecessary, thus avoiding their initial cost and cost of recovery, and reducing the problems of odor and fire-hazard.

Find out how plastisols made with Barrett "ELASTEX" plasticizers will profitably meet your requirements. Write Barrett today for our free booklet giving typical plastisol formulations. Or ask a Barrett representative to call.

BARRETT* CHEMICALS

Available to the Plastics Industry

"ELASTEX" 10-P Plasticizer
"ELASTEX" 28-P Plasticizer
"ELASTEX" 50-B* Plasticizer
"ELASTEX" DCHP Plasticizer
Dibutyl Phthalate
Phthalic Anhydride
Phenol
Crystal Urea

*Reg. U. S. Pat. Off.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

In Canada: The Barrett Company, Ltd.
5551 St. Hubert Street, Montreal, Que.

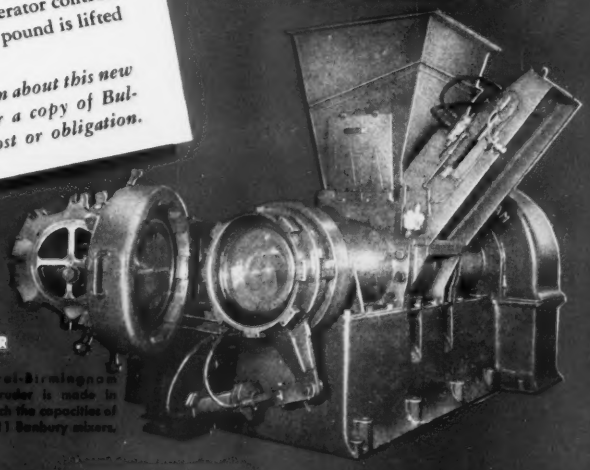
NEW STRAINER-EXTRUDER SYSTEM developed by Farrel-Birmingham FOR RUBBER PLANTS

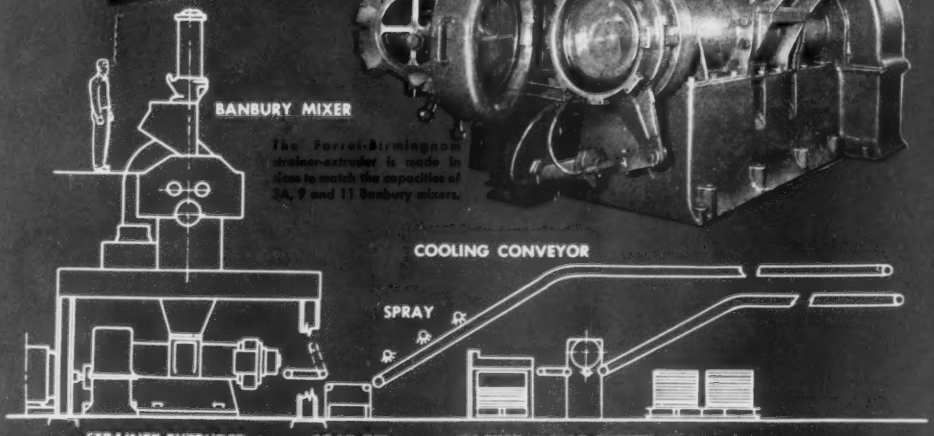
This new strainer-extruder system for master batches has a number of advantages over the conventional straining system. A continuous flow of production can be maintained at all times, the labor required for operation of the system is greatly reduced, and manual handling of stock is eliminated completely.

The combination strainer-extruder takes the Banbury batch (either direct from the mixer or by conveyor), strains it or extrudes it, or both. With a cooling conveyor incorporating a dip unit, slab cutter and stacker, material from the Banbury is automatically strained, extruded, soaped and stacked in neat piles. The two or three men required by a conventional system are no longer needed. The Banbury operator controls the entire system. Not a pound is lifted or carried manually.

For more information about this new development, send for a copy of Bulletin 33-R-502. No cost or obligation.

ONLY ONE OPERATOR REQUIRED TO CONTROL ENTIRE SYSTEM OF MIXING, STRAINING, EXTRUDING, SOAPING, STACKING





FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

DC Silicone Emulsions Outmode Muscles

A fraction of an ounce of diluted DC Mold Release Emulsion No. 35B can do more for you than a mass of muscles armed with an oak pry bar. It gives you easy release, even in the molding of heavy duty tires. It keeps clean molds cleaner longer; gives you uniformly sharp detail and high surface finish; reduces scrap to a minimum and cuts mold maintenance to the bone. There's no more fighting with the mold, no kinked bead wires, no lost heats. That's why press men, inspectors and production managers demand Dow Corning Mold Release Emulsions for molds and curing bags—DC Mold Release Fluid for green carcasses and for bead and parting line release.

FOR EASY RELEASE

SPECIFY DOW CORNING SILICONE RELEASE AGENTS

Dow Corning Silicones Mean Business!

For more information call our nearest branch office or write for data sheet M-6

DOW CORNING CORPORATION, MIDLAND, MICHIGAN

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In Canada: Fiberglas Canada, Ltd., Toronto
Great Britain: Midland Silicones Ltd., London

Dow Corning
FIRST IN SILICONES

MILLIONS

...of miniature factories...

United channel blacks are remarkable products wrested from hydrocarbon gases in miniature flames that are starved for air.

United channel blacks stem from over four million precisely regimented flame factories where each particle of black is refined in incandescent heat.

United channel blacks are collected by impingement in the nascent state and they retain their innate activity in support of high reinforcement of rubber.

United channel blacks have been in use for decades and have an enviable record of satisfactory performance. They are uniform, dependable, and ever in demand.

Think of channel black—United channel black—for durable rubber products.

UNITED CARBON COMPANY, INC.
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bags are printed with your pigment number

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are the standard for quality the world over

RESEARCH DIVISION — UNITED CARBON COMPANY — CHARLESTON 27, W. VA.

When Choosing Clutches and Brakes for Your Equipment, Look Over These

CHECK POINTS OF FAWICK SUPERIORITY

In selecting clutches and brakes for your machinery, Fawick is your logical choice. Check these six points of Fawick superiority.

1 DRUM-TYPE AIR OPERATION

Fawick clutch and brake units provide a 360° friction surface and uniform-pressure, constant-velocity contact between the full width of the friction shoes and the drum. Greatest operating torque results from the application of operating pressure at the maximum diameter.

2 OPTIONAL CONTROL

Local or remote finger-tip control of instantaneous and smooth starting and stopping increases operating efficiency. Clutch or brake action can be sensitively regulated while units are in operation.

3 SELF-ADJUSTING

The rugged Fawick actuating element automatically compensates for wear of friction shoes. This insures complete engagement and dependable service from Fawick clutches and brakes.

4 LOW MAINTENANCE

Even friction-shoe wear reduces lost production time for clutch or brake maintenance. After long periods of satisfactory service, only the friction shoes need be replaced.

5 NO LUBRICATION

Fawick design and construction eliminate the problem of clutch or brake lubrication.

6 SPACE-SAVING

Space requirements for Fawick installations are minimized due to the small number of moving parts and elimination of mechanical linkages. All conventional mounting arrangements are made with a substantial saving of vital axial space.

A Fawick clutch or brake of the correct type and size to meet your machine design and operating requirements is the best solution to your application problem. Check with Fawick before you buy.

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INDUSTRIAL CLUTCHES AND BRAKES

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FROM "STICKY" PRODUCTION PROBLEMS—

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Rubber molders have seen G-E 81161 on the job—and they've seen impressive results. This remarkable silicone emulsion speeds production . . . gives *even* release that prevents pocketing . . . steps up product quality. G-E 81161 can cut down rejects from 15% to 25%! There are good reasons for all this—these important advantages which G-E 81161 offers you . . .

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- **Hard Water Stability**—G-E 81161 remains stable 24 hours at ½% dilution in water of over 200 P.P.M. hardness.
- **Many Other Advantages**—G-E 81161 will not stain light-colored stocks, is rust-inhibited, has low toxicity, and gives outstanding performance in numerous other ways.

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For details, write to Section P-3, General Electric Company, Waterford, New York. (In Canada: Canadian General Electric Co., Ltd., Toronto.)

Smoother finished rubber buttons are obtained through the even release provided by G-E 81161.

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- **Rugged in construction, yet extremely flexible in operation, with constant-tension control at all speeds.**
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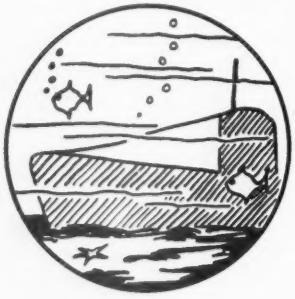

1939
U.S. SUBMARINE "SQUALUS" SANK

1939
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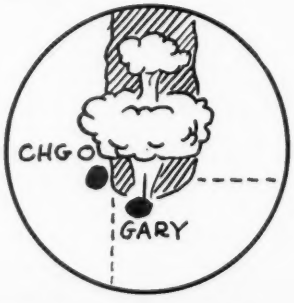
BASEBALL'S 100TH ANNIVERSARY

1939
MARBON INTRODUCED **TY-PLY**
TO THE RUBBER TRADE



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SKELLYSOLVE B. For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound.

SKELLYSOLVE C. For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve B.

SKELLYSOLVE D. For cements and variety of manufacturing operations. Good odor. Quick drying. Minimum of heavy, greasy compounds.

SKELLYSOLVE H. For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve D is desired.

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SKELLYSOLVE R. For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency.

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Take no chances with the solvent used in your manufacturing operations! Standardize on Skellysolve and be sure you're *right*. When it's Skellysolve, you can be sure of uniformity that helps maintain your product's quality, that helps you hold good customers, that helps to reduce rejects and save rubber.

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Skellysolve is less toxic than some other solvents, reduces health hazards in your plant. Helps boost production, too, because Skellysolve is sweet-smelling, pleasant to work with. It will not freeze at atmospheric temperature, has low end points, quick evaporation, a minimum of unsaturates and pyrogenic decomposition products—every feature that adds up to the almost ideal solvent.

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Skellysolve

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Look what Marvinol did for this product! In the new cellular form, this "n'Icer"* Bucket is "finger-lift" *light* . . . so *flexible* it can squeeze apart clustered ice cubes . . . so *insulating* that the ice cubes are 90% themselves after four hours! It won't *tarnish*—is *unbreakable*, is *lovely* to look at and can be made in all colors—a perfect complement to any table. It *imparts no odor or taste.*

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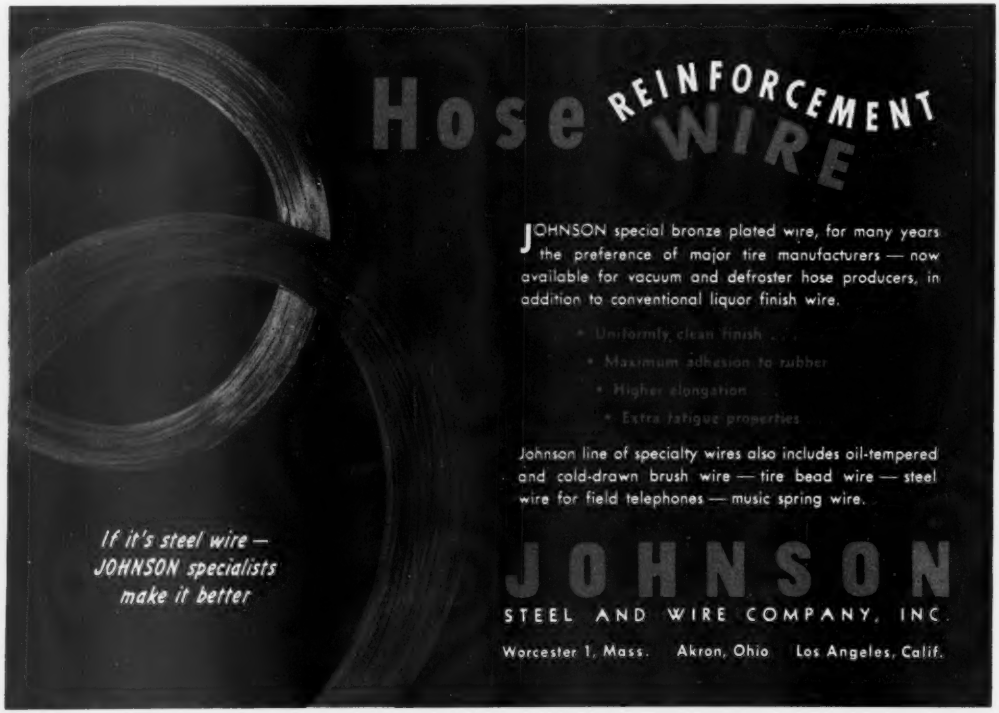
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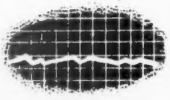

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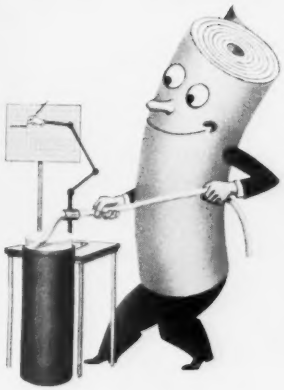

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For over 60 years Adamson United has had an important part in perfecting modern equipment and methods for the satisfactory and economical production of calendered materials.

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Tensile strength—over 2000 pounds per square inch; elongation—over 700%; tear resistance (Crescent)—200 pounds; flex-life (pierced)—over 200,000.

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It will pay you to get acquainted with Purecal. Why not write for our free booklet?

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non-scorching RESIN

a synonym for saving

SUBLAC Resin B-2-A, a white powder, is the lowest priced, non-scorching, reinforcing resin available today!

SUBLAC Resin is outstanding in its ability to impart desirable characteristics to rubber compounds. For example, it may be used to obtain any of these properties: Hardness, Stiffness, Abrasion Resistance, Tear Resistance, Oil Resistance. In many cases, the use of **SUBLAC** Resin alone is sufficient to obtain a combination of several of these properties and at the same time provide a compound with easy processing characteristics and a high general order of physicals. *In addition,* **SUBLAC** Resin *is non-scorching!*

SUBLAC Resin B-2-A is especially advantageous in stocks highly loaded with clay, whiting, or Silene. The following compounds are representative of such highly loaded, easy processing stocks that require no 'trick' mixing techniques:

Experimental Slab Stock		Experimental Tile Stock	
GR-S 521	100	GR-S 521	100
SUBLAC Resin B-2-A	30	SUBLAC Resin B-2-A	30
Circo Light	35	Circo Light	15
ZnO	5	ZnO	5
DPG	.15	DPG	.5
Altax	2.13	Altax	2.13
Hard Clay	300	Hard Clay	200
Sulfur	3.70	Whiting	150
		Sulfur	8
Cure 10′ @ 320° F			
Tensile	950		
Elongation	450%		
Shore Hardness (A Scale)	97-98	Shore Hardness (D Scale)	60-61

In these compounds, the **SUBLAC** Resin was added to the rubber, then enough clay to take up all of the oil, followed by the remainder of the ingredients in the usual manner.

SUBLAC Resin B-2-A is readily available. ***Send for your sample today!***

Prices | 29½c lb. in truck loads
30c lb. in lesser quantities
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1950 RUBBER TRADE DIRECTORY of GREAT BRITAIN

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Who's Who in the British Rubber Industry

Here for the first time is a Directory of the rubber industry in Great Britain providing complete details on all branches of the manufacturing field, as well as on suppliers of chemicals, machinery, etc.

As an added convenience, both the Table of Contents and the Classified Index are printed in English, French, German and Spanish.

Basically patterned after the RUBBER RED BOOK, the 1950 RUBBER TRADE DIRECTORY OF GREAT BRITAIN was compiled by the staff of the India-Rubber Journal (London).

This directory is sold in the United States and Canada by RUBBER AGE and is available for immediate delivery.

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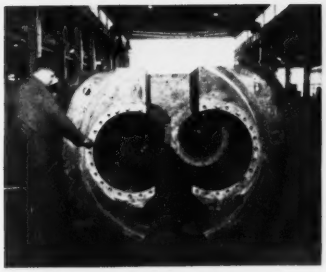

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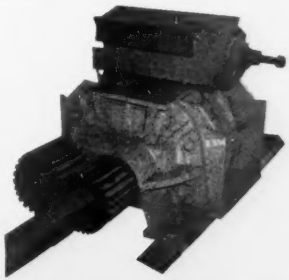

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RUBBER AGE

Vol. 69, No. 3 JUNE, 1951

Copper Compounds in Latex and in Rubber

I—The Quantitative Determination of Minute Amounts of Copper

By G. J. van der BIE

Director, Indonesian Rubber Research Institute, Bogor, Java

To determine the presence of minute quantities of copper in crude rubber the colorimetric method was used with the aid of diaethyldithiocarbamate, a protective colloid added to obtain a linear relation between the intensity of color and the copper concentration. Many other ions of metals, such as iron and zinc, exercise a disturbing effect upon this determination, for which reason the copper should first be separated from the ash solution. This can be effected quantitatively by micro-electrolysis or by precipitating the copper as a sulfide, provided certain precautions are taken. A method has been found for determining the copper content of crude rubber with an accuracy to within 0.5 μg of copper (= 0.01 mg%).

THE copper content of a sample of rubber can be expressed either in per cent or in mg per 100 grams (indicated as mg%), where 0.0010% = 1.0 mg%. As a rule, rubber contains a copper content of 0 to 1 mg% and accordingly upon analysis, on the basis of 5 grams of the rubber sample, it is found to contain a quantity of from 0 to 50 μg of copper. The method of analyzing, therefore, must be such that these quantities can be accurately determined. Even as late as 1933 it was found that the margin in determining a quantity of 100 μg of copper might actually vary from 10 to 20%, according to three different methods employed *(53)*, but since then the methods utilized have been greatly improved. Various investigators have mutually compared critically the methods most in use, and the results they arrived at are summarized in Table I.

In actual practice, only the dithiocarbamate and the dithizon methods were maintained. The dithizon method requires the colored copper compound to be shaken out of the analysis solution with the aid of carbon tetrachloride, but this was felt to be a serious obstacle in serial examinations under war conditions, when it was necessary to keep the apparatus as simple as possible.

Table I—Principal Reagents Used

Reagents	Ansbacher et al 1931 *(3)*	Durst 1935 *(17)*	Conn et al 1935 *(12)*
Ammonia		Above 50 μg	
Xanthate	Too high, best results at 100-200 μg	Color quickly recedes	Difficulties with pH
Biazzo	Slightly too low, best results at 50-150 μg		Effective above 10 μg
Chromotrope	2-3 μg to 0.5 μg	Below 50 μg	Difficulties
Dithiocarbamate	Good at 50 μg		Good up to 2 μg
Dithizon		4-5 μg	

Note: This is Communication No. 71a of the Indonesian Rubber Research Institute.

TABLE II—EXTINCTION COEFFICIENTS OF COPPER-CARBAMATE SOLUTIONS

Protective colloid			No colloid present			1 ml of a 1% solution of gum arabic		
μg copper per ml			0.5	1.0	1.5	0.5	1.0	1.5
Various cuvette thicknesses:								
¼ cm			——	——	0.132	0.052	0.080	0.102
½ cm		blue	0.022	0.168	0.268	0.064	0.092	0.128
1 cm		filter,	0.059	0.168	0.235	0.039	0.081	0.128
2 cm		463 mμ	0.074	0.161	0.254	0.032	0.092	0.120
5 cm			0.095	0.172	0.262	0.034	0.095	0.134
Different light filters:								
red	750 mμ		0.005	0.028	0.037	0.000	0.000	0.004
red	729 mμ	at a	0.018	0.031	0.040	0.000	0.005	0.006
red	619 mμ	cuvette	0.019	0.040	0.072	0.000	0.006	0.016
yellow	572 mμ	thick-	0.027	0.059	0.096	0.000	0.002	0.023
green	530 mμ	ness	0.048	0.107	0.155	0.000	0.030	0.052
green	494 mμ	of	0.077	0.151	0.212	0.019	0.054	0.113
blue	463 mμ	½ cm	0.085	0.177	0.262	0.034	0.094	0.184
purple	434 mμ		0.095	——	——	0.031	0.096	0.174

The choice, therefore, fell to the dithiocarbamate method described by Callan and Henderson *(9)*.

Sodium-diaethyldithiocarbamate, $(C_2H_5)_2NCSSNa$, with copper ions produces a goldish brown precipitate, or, if very dilute, it gives a colloidal solution of a yellowish brown color. The reaction can be obtained in a neutral, a slightly alkaline, or a slightly acid medium. Iron causes the color to become brown, while lead and zinc produce a white turbidity.

Colorimetric Determination of Copper-Diaethyldithiocarbamate

The brown compound of copper-diaethyldithiocarbamate is soluble among others in carbon tetrachloride *(21)*. In this solution, the intensity of color, according to McFarlane *(36)*, is directly proportional to the concentration, although according to Haddock and Evers *(23)* and other investigators this is not the case. However, for practical reasons the shaking out of the analysis solution with an organic solvent should be avoided as much as possible. In an aqueous solution the copper-carbamate is not molecularly dissolved but is in colloidal dispersion, and it is known that the determination of the color of colloidal solutions is fraught with considerable difficulty *(30)*.

By means of the Zeiss-Pulfrich photometer *(43)*, it was first endeavored to determine to what extent the colloidal solution of the copper-carbamate followed the law of Lambert-Beer, and it soon became evident that it was indeed necessary to add a protective colloid *(24, 28, 37)* so that all observations made without a protective colloid would have to be regarded as doubtful. The adsorption at different wave lengths was also determined. Here the maximum was found to lie at 460 mμ; the literature mentions a maximum for the CCl_4 solution of 430 mμ (40).

In all investigations 10 ml of the 0.1% reagents were used at a final volume of 50 ml in a medium of a 2% solution of sulfuric acid. Table II shows the outcome of this investigation, in which the thickness of the cuvette refers to the thickness of the liquid layer. Where the cuvette has a thickness of either ½ or 1 cm there are certain deviations, so that its thickness must be at least 1½ cm.

The provisional experiments showed that in a medium of 2% sulfuric acid or 2% ammonia the color is more intensive than it is in a neutral medium. This was determined in actual figures by means of the Zeiss-Pulfrich photometer, as indicated in Table III. It was also found that in the course of time the color intensity changes, so that it is necessary to colorimetrize the solutions as soon as possible after preparation.

The effect of the buffer solutions was also controlled, and in this connection it was found that it was only the acetic acid-acetate buffers that provide about the same values as do the 2% sulfuric acid and ammonia solutions, provided, of course, there is a protective colloid. Citric acid phosphate buffers and, to a lesser degree, boric acid-borate buffers exhibit deviations, probably because of the formation of complexes. Sulfuric acid and ammonia produce a similar result, provided again there is a protective colloid. Most investigators prefer to use a weak ammoniacal medium, but for practical reasons, such as the fact that the brass parts of the colorimeter are easily affected by ammonia, preference is given to the 2% sulfuric acid solution.

The extinction coefficient is directly proportional to the copper concentration, provided there is a protective colloid, as will be evident from Figure 1.

In the routine experiments the Hellige colorimeter of the Duboscq type was always used with a 25 ml absorption cell. For serial work this type was preferred to the Zeiss-Pulfrich photometer, although with the latter the standard gage curve need be determined only once.

Effect of Interfering Ions and the Formation of Complexes

Callan and Henderson *(9)* and Taylor-Austin *(57)* state that the ions of silver, lead, mercury, antimony, cadmium, tin, and zinc give a whitish turbidity with the dithiocarbamate reagent, as does calcium when added in great excess *(45)*, while bismuth, iron, manganese, cobalt, and nickel form a colored compound in this manner, disturbing the color measurement of the copper compound. Arsenate, phosphate, and nitrate do not disturb this effect, but cyanide does, due to the formation of a complex with the copper ions. Nitrous vapors interfere

TABLE III—EFFECT OF THE MEDIUM AND OF THE TIME ELAPSED AFTER THE PREPARATION OF THE EXTINCTION COEFFICIENT

(Thickness of cuvette, 5 cm; Filter, 463 mμ; Without protective colloid)

μg of copper per ml	Time after preparation	2% solution of sulfuric acid (pH = 1.1)	Distilled water (pH = 6.5)	2% solution of ammonia (pH = 11.0)
0.0	Within	0.000	0.000	0.004
0.4	5 minutes	0.098	0.015	0.052
0.8		0.140	0.079	0.096
1.2		0.206	0.130	0.216
1.6		0.273	0.147	0.255
2.0		0.344	0.162	——
0.0	After	0.000	0.000	0.003
0.4	½ hour	0.096	0.020	0.047
0.8		0.130	0.088	0.090
1.2		0.206	0.130	0.142
1.6		0.264	0.148	0.209
2.0		0.328	0.168	0.240
0.0	After	0.000	0.000	0.002
0.4	1 hour	0.096	0.018	0.042
0.8		0.122	0.095	0.089
1.2		0.188	0.133	0.140
1.6		0.247	0.151	0.206
2.0		0.304	0.168	0.237
—	After 1 day	Flocked out	Good	Good

seriously, so that any nitrite will always have to be previously removed, which can be effected by boiling with ureum.

Due to the nature of this investigation, only the disturbing effects of the ions of iron, manganese, and zinc, and of a few other anions were determined, since the ash of crude rubber contains only minute quantities of calcium *(7)* and iron *(8)* and practically none of the above-mentioned heavy metals. If the determination of copper is also to be effected in examining vulcanized rubber, the possible presence of one or more of such disturbing ions must be kept constantly in mind. Our investigations, however, remained limited in view of the fact that in any plain vulcanizate only zinc occurs. If it is assumed that the rubber sample contains a maximum of 0.1% of soluble iron and 5% of zinc, then a copper content of 0.5 mg% will correspond to an excess of 200 for iron and one of 10,000 for zinc.

It was found that in diluted sulfuric acid the effect of phosphate, chloride, and nitrate is inconsiderable, provided one applies colorimetrization soon. Manganese also has little disturbing effect, even in a 100-fold excess. Iron has no disturbing effect in a 10-fold excess, but it does have one in a 100-fold excess. Zinc, on the other hand, is disturbing in as little as a 10-fold excess. The practical method of elimination, therefore, will have to be based upon the removal of the zinc as well as the iron ions.

Eliminating Iron by Means of Ammonia: Supplee and Bellis and many other investigators *(9, 10, 17, 25, 26, 41, 45, 47, 56)* precipitate the iron in the form of hydroxide by means of ammonia, but this does not seem to be a reliable method. According to Kehren and Mocken *(31)* and Dekker *(14)* too low a copper content is found due to an adsorption in the iron-hydroxide precipitation, whereas according to Ansbacher and coworkers *(3)* the results are too high. It should be emphasized that the ammonia solution may not be filtered off the iron-hydroxide precipitate by means of filter paper, because the cellulose absorbs a considerable quantity of copper.

Complex Formation of Iron and Zinc: It is possible that the disturbing effect on the part of the iron and zinc ions can be removed by producing certain complex compounds. According to Hoar *(28)* it can be accomplished in the case of zinc by using an excessive quantity of ammonia. With regard to iron, many investigators, including Drabkin and Waggoner, used a citrate *(15, 23, 27, 28, 31, 40)*; Chalk and Bauer used a tartrate *(6, 11)*, while McFarlane and a few others, following Warburg's example, made use of a pyrophosphate *(13, 28, 36, 60)*.

Our own experiments with a 2% solution (final concentration) of citric acid, sodium phosphate and pyrophosphate, indicated that in a 2% sulfuric acid solution even a like quantity of iron is disturbing on 25 μg of copper. A 10-fold excess of zinc does not produce a disturbing effect, but a 100-fold excess does create a disturbance. In a 2% solution of ammonia or in a sodium hydroxide an equal quantity of iron has no disturbing effect, but a 2½-fold excess does.

This method, therefore, is not to be recommended where it is necessary to determine accurately the presence of small amounts of copper. A 100-fold excess of zinc is harmless, but a 1,000-fold excess is noxious.

Extracting the Colored Copper-Dithiocarbamate: In most cases the formation of complexes is combined with the extraction of the colored copper-dithiocarbamate with the aid of an organic solvent. Grendel used carbon tetrachloride for this purpose, as did many other investigators *(22, 23, 25, 31, 32, 40)*. According to McFarlane, the intensity of color is directly proportional with the concentration, but Haddock and Evers obtained other results. Nydahl, in turn, noted a distinct absorption of iron in the CCl_4 extract. McFarlane *(36)* used amyl-alcohol, while Thatcher *(10, 58)* recommends iso-amyl alcohol and Drabkin *(16)* iso-amyl acetate. Our own experience is that this method cannot be used for an accurate determination of small quantities of copper.

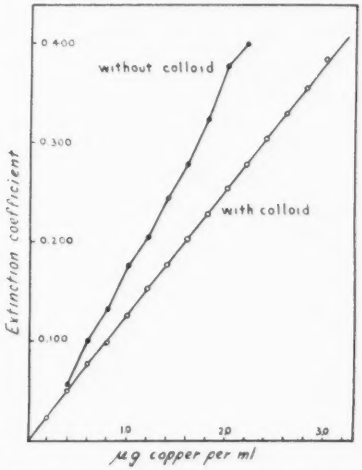

FIG. 1—Relation between concentration and extinction coefficient.

An Explanation...

This article is the first in a series of four articles on "Copper Compounds in Latex and in Rubber." The detrimental effects of copper compounds upon the aging of crude and vulcanized rubber have long been known, but experience in this respect was gained mainly in the rubber manufacturing industry. The investigation covered in the four articles to be published constitutes a distinct contribution to the knowledge of the occurrence and the origin of copper in crude rubber, as well as on the behavior of this copper during the preparation of crude rubber. The investigation was the subject of a dissertation prepared by the author, Dr. van der Bie, under the guidance of Dr. A. van Rossem, Director of the Rubberinstituut T.N.O., Delft, Holland.

Separating the Copper by Micro-Electrolysis

The micro-electrolysis of copper has long been employed *(12, 22, 27, 29, 38, 42, 44, 46, 61)*, usually under a voltage of 2 volts; for instance, Grendel used 2 volts, 10-15 mA, and 15-20 min. at 100° C., as did Mulder *(38)*. The only difficulty in this determination consists in removing the electrodes after electrolysis has been completed, since the immersion liquid must be replaced by distilled water without interrupting the current or else a part of the copper will again dissolve as a result of polarization. To overcome this difficulty, various types of electrolysis containers and siphon arrangements have been applied.

In our investigations we made use of platinum elec-

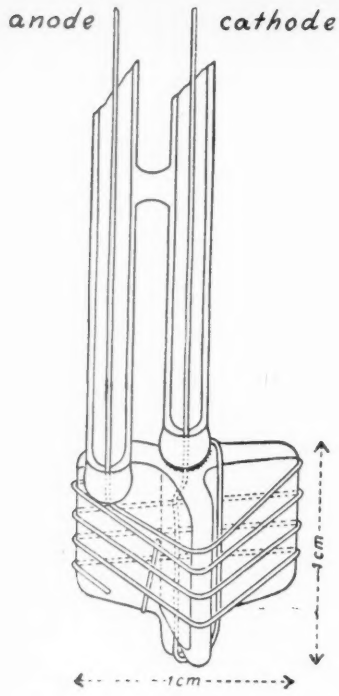

FIG. 2—Electrodes of the micro-electrolysis.

trodes (see Figure 2) of such proportions that an ordinary test tube could serve as the electrolysis vessel, while the electrolysis can be effected, if necessary, within a volume of only 2 ml. Basically, the apparatus consists of a central cathode around which there is an anode casing on a glass framework. A special siphon arrangement is not required, since because of the tiny dimensions there always remains contact with the liquid when the electrodes are being removed and when rinsing takes place by means of a siphon. It will be seen, therefore, that the manipulations are quite simple.

As is usual, an electrolysis volume of 5 ml was used in a test tube of 25 ml, placed freely in a tumbler containing water. Due to its slight tilt and the occurrence of small gas bubbles, adequate circulation of the liquid was obtained during the electrolysis. Where necessary, the tumbler was warmed by means of hot water, resulting in but a small loss of the electrolysis liquid through evaporation. Upon completing the electrolysis the copper was dissolved in 2 ml of a warm 10% solution of nitric acid. After the nitrous vapors were removed, the colorimetric determination was effected in the usual manner. The results of the observations are tabulated in Table IV.

From the figures in Table IV it is evident that the separation of 25 μg of copper takes place well nigh quantitatively within approximately 15 minutes at 98° C. (which is the boiling point of water at Bogor) in a volume of 5 ml, and that the presence of a 1000-fold excess of iron or of a 10,000-fold excess of zinc has but a slightly disturbing effect.

It should be pointed out that for making serial investigations by means of the electrolysis method a great number of tiny electrode devices are required, and in most cases this will constitute a serious drawback.

Separating the Copper as Sulfide

Many investigators have used the method of separating the copper as a sulfide in an acid medium *(1, 3, 5, 12, 13, 14, 20, 35, 48, 50)*; some of them, however, obtained results that were not quite accurate *(11, 18)*. Ansbacher and co-workers determined the conditions required, i.e., the separation is based upon the precipitation of the copper as a sulfide, but as it is present only in minute quantities it is quite likely that the copper sulfide remains in colloidal dispersion and accordingly it runs through the filter. To prevent this, a sulfur precipitation (nitric acid with H_2S) is caused before filtering, which precipitate drags the copper sulfide along. Also, during filtering and rinsing, the filter should be kept filled in order to prevent oxidation of the copper sulfide by the air. If these precautions are provided no difficulties will be experienced.

In our investigation this method was applied according to the directions of the Netherland Government Rubber Service, which Dekker formulates as follows: "To the ash of 5 grams of rubber add a few ml of nitric acid (d = 1.4) and 1 to 2 ml of a 50% solution of sulfuric acid; remove the nitric acid on the water bath, dissolve the residue in a 10% solution of sulfuric acid, bring it to the boil, introduce H_2S until cold, add 0.3 ml nitric acid (d = 1.4), filter through copper-free paper, rinse the precipitate with a 3% solution of acetic acid (saturated with H_2S), reduce to ashes in a small porcelain crucible, add a few drops of nitric acid, and evaporate on the water bath until dry." Thereafter apply the usual colorimetric determination.

According to Dekker, the separation need not be effected in the case of crude Hevea rubber with a few tenths of a per cent of ash. The results of our investigations are summarized in Table V.

Some copper is lost in the use of this method, but for all practical purposes the method is quite serviceable.

TABLE IV—COPPER SEPARATION THROUGH MICRO-ANALYSIS

(2% Solution of sulfuric acid; 25 μg of copper; 2, 4-2, 6 V; 25-30 mA; adjustment to 50 mm)

Time variable	Reading	Time variable	Reading
Volume 5 ml		Volume 10 ml	
18 h. 25-27° C.	52-52 mm	18 h. 25-27° C.	51-50 mm
4 h. 25-27° C.	38-42 mm	¼ h. 98° C.	33-35 mm
2 h. 60° C.	49-48 mm	½ h. 98° C.	51-48 mm
1 h. 60° C.	45-42 mm	¾ h. 98° C.	50-49 mm
½ h. 60° C.	34-44 mm	1 h. 98° C.	51-49 mm
½ h. 80° C.	50-49 mm		
¼ h. 80° C.	44-46 mm	Volume 15 ml	
¾ h. 90° C.	47-49 mm	18 h. 25-27° C.	49-49 mm
½ h. 98° C.	50-49-49-48 mm	¾ h. 98° C.	48-46 mm
¼ h. 98° C.	51-49-48-51-50-49 mm	1 h. 98° C.	49-48 mm
¾ h. 98° C.	blank 1-1 mm		

5 ml; ¼ h. 98° C.

Presence of iron or zinc	Reading
1000 x Fe...	49-49 mm
1000 x Zn..	48-49 mm
100,000 x Zn..	turbidly white

5 ml; ¼ h. 98° C.

Copper added	Found
Blank	0.5- 0.5 μg
10.0 μg of copper	10.0-11.0 μg
20.0 μg of copper	19.0-20.5 μg
30.0 μg of copper	29.0-31.0 μg
40.0 μg of copper	39.0-39.5 μg
50.0 μg of copper	49.5-51.5 μg

We cannot, however, recommend the use of thiosulfate *(59)* instead of hydrogen sulfide.

In serial investigations, however, the introduction of H_2S and the considerable time it takes to precipitate and rinse must be regarded as a serious drawback. In addition, copper-free filter paper is required for proper application of the method, and such paper was lacking due to wartime conditions. It was therefore found desirable to revise the technique used in our method.

Results obtained by the method of separating the copper sulfide by shaking out with chloroform, according to the procedure of Gebhardt and Sommer *(20)*, were not too good. Ultimately the following changes proved acceptable: Instead of filtering, centrifuging was adopted, as suggested by McFarlane and by Conn and his co-workers *(12, 36)*; the volume of the acid solution was reduced to 10 ml; instead of introducing H_2S, a few drops of a concentrated Na_2S solution were added; the sulfur was made to precipitate by adding a few drops of a concentrated thiosulfate solution; the sulfur precipitate was coagulated by adding sulfuric acid; the rinsing was effected with a 2% solution of sulfuric acid plus Na_2S, since zinc sulfide does not readily dissolve in diluted acetic acid. After dissolving the precipitate in nitric acid and dispersing the nitrous vapors, the solution can be prepared for color determination. To coagulate the sulfur precipitate, a momentary boiling is sufficient, as indicated in Table VI.

It was found that due to the small volume of liquid a little less copper is lost, so that good results are now obtained. If there is a great abundance of iron, then the separating process has to be repeated.

Ashing of the Rubber and Dissolving the Ash

In reducing organic material to ashes there are various factors that cause a loss of copper *(39, 47)*. The rubber sample, therefore, must be incinerated in such a manner that first, by means of a small flame, the greater portion of the rubber hydrocarbon is decomposed and made to evaporate; thereafter the residue must be incinerated with a plentiful admission of air. In our investigation this was effected in an electrical oven in which the temperature could be maintained accurately within 10° C.

At the incinerating temperature there may also be a loss of copper in the form of a volatile chloride *(17, 31, 34, 55)* and accordingly in most cases it is advisable to apply a wet destruction *(3, 4, 45)* as with concentrated nitric acid and sulfuric acid. As is known, it is difficult to do this in the case of rubber. Kirchhof, for example, destroys with nitric and sulfuric acid, but in doing so incinerates the nitro-rubber. The incineration must therefore be effected at a low temperature. According to Supplee and Bellis *(56)* a temperature of 510 to 565° C. should be employed, according to Ansbacher and coworkers and Durst it should be below 400° C., and according to Schonk *(52)* it should be 450 to 500° C.

According to Nydahl *(40)*, if the ash contains much silica then there may also be a loss of copper through the formation of insoluble copper silicates. The wet destruction of material containing silica is harmless *(45)*. There is even mention in the literature of loss through the use of glazed porcelain incinerating crucibles *(19, 31)*, but this has not been fully confirmed.

In this investigation we found that a temperature of 500° C. is still innocuous, but that it is necessary that all chlorides be removed. To accomplish this in the case of a number of rubber samples, we added, about an hour before incineration, ½ ml of concentrated sulfuric acid to each 5 grams of rubber, taking care that the rubber was well moistened by the acid. The numerical results so obtained are summarized in Table VII.

TABLE V—SEPARATION OF THE COPPER AS SULFIDE

(Precipitation volume, 50 ml; filter paper, Schleicher and Schull 589)

Copper added	Found	25.0 μg of copper	Found
10.0 μg	9.2- 9.2 μg	100 x Fe...	24.5-24.0
20.0 μg	19.3-19.5 μg	1000 x Fe...	24.5-24.0
30.0 μg	29.6-29.7 μg	100 x Zn..	23.0-23.5
40.0 μg	39.5-39.7 μg	1000 x Zn..	23.0-23.5
50.0 μg	49.4-49.5 μg	10000 x Zn..	23.5-24.0
25.0 μg 24.0-24.5-23.5-24.0-23.5-24.5 μg		100000 x Zn..	23.5-24.0
Blank (already discounted in various returns)	1.5- 2.0 μg	No H_2S, but 5 ml of thiosulfate	21.5-22.5 23.5-21.0

TABLE VI—RESULTS OF THE SIMPLIFIED METHOD

(Final concentration 5% sulfuric acid solution; 500-fold excess of iron)

Coagulation of the sulfur precipitate	Presence of 25 μg of copper
Momentary boiling	Found 25.0-24.5 μg of copper
1 hour room temperature	25.0-24.5 μg of copper
already discounted	1.5- 1.5 μg of copper

TABLE VII—EFFECT OF SULFURIC ACID UPON INCINERATION

Rubber	Incineration: Without sulfuric acid (mg% of copper)	Incineration: With sulfuric acid (mg% of copper)
Immediate colorimetrization of the ash solution		
DS of purified latex	0.60-0.62	0.60-0.62
Crepe rubber poor in albumen	1.56-1.60	1.20-1.24
Separation by micro-electrolysis		
DS of purified latex } as above	0.60-0.60	0.60-0.60
Crepe rubber poor in albumen }	0.82-0.80	0.88-0.90
Separation as sulfide		
DS of purified latex } as above	0.64-0.66	0.62-0.64
Crepe rubber poor in albumen }	0.80-0.84	0.88-0.92
Latex-rubber powder	1.28-1.32	1.39-1.44
First latex crepe	0.42-0.44	0.40-0.42
Crepe rubber poor in albumen	0.23-0.24	0.21-0.23
Rubber reduced by evaporation	0.33-0.38	0.49-0.51
Rubber reduced by evaporation (of creamed latex)	0.25-0.26	0.28-0.30
Rubber reduced by evaporation	0.25-0.29	0.38-0.40
Vulcanized rubber poor in albumen	0.99-1.03	0.98-1.01

TABLE VIII—RESULTS OF A CONTROL DETERMINATION

Rubber reduced by evaporation	Found 32-32 μg of copper
Added 10 μg of copper	42-43 μg of copper
Added 20 μg of copper	56-58 μg of copper

The results indicate that the use of sulfuric acid is to be recommended more specifically in the case of rubber reduced by evaporation, and generally for any rubber that might contain chloride. To the extent that the latex is purified, or whenever the rubber is obtained through coagulation with an acid, the application of sulfuric acid becomes less necessary. Table VII also indicates that the direct colorimetrization (i.e., without separating the copper) of the ash solution may sometimes produce good results, but that it is not admissible in the case of crepe rubber, which always contains traces of iron *(8)*.

Finally, a few control determinations were effected in which various quantities of copper were added to a rubber reduced by evaporation. The determinations were made by incineration with sulfuric acid and by separating the copper by means of micro-electrolysis, and subsequently by applying the usual colorimetrical method. The results are shown in Table VIII, from which it is apparent that there was a good accordance.

Sometimes hydrochloric acid is used to dissolve the rubber ash *(1, 2, 25, 33, 50, 51)*, often in combination with $KClO_3$, but in view of what has been stated above this method is not to be recommended. Other investigators dissolve the ash by means of soda-salpeter *(1)* or bisulfate *(49, 54)* but the silicate copper that may occur in the rubber fillers is also determined in this way. Silicate copper, however, has no deleterious effect upon the durability of the rubber.

The method of determination, therefore, must remain limited to the actually noxious copper. The Netherland Government Rubber Service *(14)*—now the Rubber Institute T.N.O.—prescribes for this purpose the application of a certain concentration of sulfuric acid and nitric acid, and in this investigation that method was applied. The blank value of the determination should of course be minimal so only water distilled in glass vessels should be used.

Method for the Quantitative Determination of Minute Amounts of Copper

A satisfactory method for the quantitative determination of minute amounts of copper is as follows: To 5.0 grams of rubber in a porcelain crucible 10 drops of strong sulfuric acid are added, making certain that the rubber is thoroughly moistened. After standing for at least one hour the rubber is then incinerated by means of a small flame. After all volatile components have been eliminated, the crucible is put into an electric oven where it is heated at 500° C. for two hours. The presence thereafter of a few coal particles is not disturbing.

To the ash so obtained 5 drops of a 50% solution of sulfuric acid and 3 drops of nitric acid (d = 1.2) are added, whereupon the nitric acid is damped off on the water bath. A few ml of copper-free distilled water is then added, the ash solution is transferred to a centrifuge tube of 15 ml with a gradation up to 10 ml, replenished with water up to 10 ml, and the still undissolved components are centrifuged and decanted carefully into another centrifuging tube.

One drop of concentrated ammonia, 2 drops of a 50% solution of thiosulfate, and 4 drops of a 50% solution of sodium polysulfide are then added and the solution is mixed well; after mixing, 5 drops of strong sulfuric acid are added and the solution is mixed again. For each crucible used 20 ml of rinsing liquid is prepared simultaneously by adding 2 drops of the sulfide solution to 20 ml of a 2% sulfuric acid solution. After standing for one hour, the solution is centrifuged for 1 to 2 minutes, during which the liquid need not become entirely clear but may remain somewhat milky in appearance. The liquid is then decanted, with the tube being properly drained (with the edge observed closely).

After the liquid has been decanted the tube should be rinsed twice, each time with 10 ml of rinsing liquid, and centrifuged for one minute. In rinsing, the precipitate must become properly dispersed throughout the rinsing liquid. To the precipitate is added 1 drop of a 50% solution of sulfuric acid and 1 drop of nitric acid (d = 1.2), after which it is heated over a micro-burner until the white vapors are gone and the sulfur melts down to a yellowish brown globule. No nitrous vapor may remain.

After the precipitate has cooled, 10 ml of a 2% solution of sulfuric acid is added, if necessary centrifuging for a moment in order to remove any sulfur particles. After decanting into a receiver of 25 ml capacity, add 9 ml of a 2% solution of sulfuric acid, 1 ml of a 1% solution of gum arabic, and 5 ml of a 0.1% reagent, and then compare it as quickly as possible in a Duboscq colorimeter with a similarly prepared standard solution containing 25 μg of copper in 25 ml. By adjusting the ash solution at 5.0 mm, a reading of 1 mm of the standard solution corresponds to 0.01 mg% of copper in the rubber.

The blank value may not exceed 0.5 μg (below 1 mm). The basic copper solution contains 1 mg of copper per ml, i.e., 392.3 mg of $CuSO_4$. 5 aq. in 100 ml. This solution is diluted 1:100 and of this diluted solution one takes for each determination 2.50 ml (25 μg of copper). The solution of the dithiocarbamate reagent must be prepared afresh each month and must be kept in a dark bottle. It is necessary that distilled water that is copper-free be used at all times.

The sensitivity of the determination amounts to approximately 0.5 μg of copper. The duplicability for each 5 grams of rubber is about 1.0 μg of copper or 0.02 mg%.

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Handling System Reduces Production Costs of Rubber Parts

A NUMBER of time studies show that 30% and more of production costs are invested in materials handling alone. This is especially true of the manufacturing plant producing light but bulky items, such as rubber parts. Hard-to-handle rubber products have a tendency to travel slowly from operation to operation and have the costly, voracious characteristic of biting deeply into production efficiency and company profits.

Normally, such a problem would remain a production man's headache until he solves it with a materials-handling method such as is now used by an eastern manufacturer of sponge rubber products. In this plant, rubber parts come off the molding press in various sizes, lengths, and shapes weighing from about an ounce up to one or two pounds. The very nature of the parts makes them difficult to handle since they are soft and pliable with "bounce" and plenty of "life."

Previously, cardboard cartons were used, proving entirely unsatisfactory because cartons cannot be piled safely or handled repeatedly without breaking. Heavy boxes of various sizes also proved to be undesirable because of clumsy, dead weight and lack of uniformity. A materials-handling system had to be employed that would help move the items quickly and efficiently from production to assembly to finishing and finally to storage with a minimum of handling and requiring a minimum of space.

The solution came with the installation of Lewis Woven Wood-and-Wire Stacking Boxes, made by the G. B. Lewis Co., of Watertown, Wisconsin. These relatively lightweight industrial containers are unusually strong—built with wooden slats, bound with wire, fastened to hardwood frames, and reinforced with metal corners—to meet the everyday requirements of rough handling encountered in a modern factory. These containers are easy to place next to machinery, easy to load, and easy to move to and hold in storage for the next operation. A filled container of sponge rubber parts is easily lifted and handled by one man. They are used in the production, assembly, finishing, and storage departments.

Parts stripped from the mold may be readily dropped into a Lewis Container.

Electronic Metal Detector Protects Calender Rolls

ELECTRONIC metal detectors provide the needed ounce of prevention worth a pound of cure for calendering operations in plastics and rubber processing plants. This latest application of electronics for industrial purposes effects considerable savings by protecting vital equipment from damage by tramp metal found in rubber or plastic sheets, guarantees product quality and good name, and reduces costly shut-downs, repairs and spoilage to a minimum.

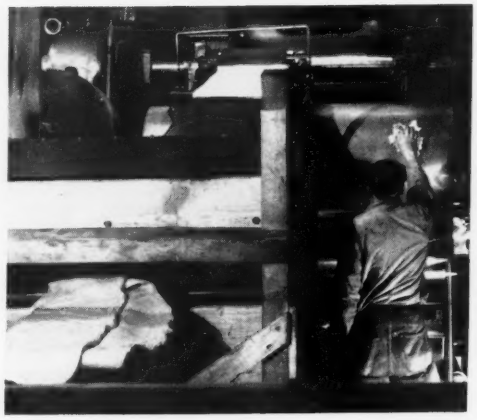
Respro, Inc., Cranston, R. I., had considerable difficulty in protecting its highly polished calender rolls from damage by stray metals found in granulated vinyl plastic material. Undetected metal particles often caused enough damage to stop operation.

Because the magnetic separator failed to extract non-magnetic metals, or those too deeply embedded in the plastic to be detected, production had to be halted from one to three weeks while rolls were being repaired, an expensive and drawn-out project. In addition, final products were often marred by the inclusion of undetected metals.

An electronic metal detector was installed on an inclined plane between the supply mill holding plastic to be processed and the calender where the milled plastic is sheeted into desired gauge and width. The detector was supported by a shop-built wooden cradle and shock-mounted with sponge rubber pads at the sides and bottom to immunize it from normal building and conveyor vibration. The detector installed was a product of the Allis-Chalmers Manufacturing Co., of Milwaukee, Wisc.

The hot plastic was fed by an inclined continuous conveyor belt operating between the rectangular compartments containing a radio wave transmitter in the upper part and a receiver in the lower. Set at 36 feet per minute, the belt transported a steady stream of plastic through the opening of the high frequency electric field for screening.

Illustration of method for installing electronic metal detector around inclined belt.



Close-up of plastic material passing through the detector at the Respro plant.

The conveyor belt was arranged so that the operator is able to either drop pieces of hot plastic upon the belt or feed a continuous narrow ribbon of it to the calender feed bank. No other direction of material is necessary.

An electron-tube amplifier detects any piece of magnetic or non-magnetic tramp metal passing through the inspection opening. Upon detection, the amplifier triggers an alarm and stops the belt automatically so that contaminated plastic within the inspection area can be removed and stored for removal of foreign particles.

The electronic metal detector, which can be used as a permanent or portable inspection unit, detects all metal particles down to .070-inch in diameter. This sensitivity provides adequate and efficient protection for rolls. The danger of damage to calender rolls has been materially reduced at Respro, and plastic sheet spoilage has been cut to a minimum. Consequent production gains and savings at Respro prompted the purchase of a stand-by unit and adoption of a strict unalterable policy that all plastic must pass through the detector before calendering.

The unit is a compact, space saving piece of equipment, measuring 43 inches long, 15 inches wide and 20 inches high, not including height of aperture. It is sealed against dust, dirt, lint and is not sensitive to nearby metal or electrical equipment. Under favorable operating conditions, conveyor belts can be speeded up to 600 feet per minute without impairing efficiency. The unit can be installed vertically or horizontally for use on conveyors, inclined chutes, or inspection of falling or continual-flow materials.

Electronic metal detectors find many other useful applications in the rubber and plastics industries. They are especially suitable for inspection of plastic scrap because these are apt to contain a greater variety of metals, many of them embedded in the material so that ordinary magnetic separators cannot detect them, especially if the metals are non-magnetic. Simple horizontal installations, similar to the one depicted on this page, are among the many possible arrangements to which the detector lends itself.

Oil-Extended Synthetic Rubber Including Oil-Masterbatched GR-S

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and P. S. GREER

Office of Rubber Reserve, R.F.C., Washington, D. C.

"OIL-MASTERBATCHED GR-S" is an oil-extended synthetic rubber manufactured in Office of Rubber Reserve (RFC) GR-S plants by the addition of substantial proportions of rubber processing oil before the synthetic latex is coagulated, dried and baled. By polymerizing GR-S to a high molecular weight before adding the oil, the latter can substitute for low-molecular-weight butadiene-styrene polymer that would otherwise be present and thereby effectively extend the rubber hydrocarbon with a more available less expensive material.

At present the varieties of oil-masterbatched GR-S in production are X-628, composed of 25 parts of rubber processing oil in 100 parts of high viscosity (65-75 MS-4) cold rubber; X-629, which is similar but contains in addition 50 parts of HAF carbon black; and X-646, composed of 25 parts of rubber processing oil in 100 parts of high Mooney (80 ML-4) hot rubber. (Throughout the remainder of this article, for the sake of brevity, oil and black loadings will be stated simply in parts, meaning parts per 100 parts of rubber hydrocarbon, unless indicated otherwise).

This production of oil-masterbatched GR-S is based primarily on process studies by the Goodyear Tire & Rubber Company's Research and Chemical Engineering Divisions under sponsorship of the Office of Rubber Reserve, and product evaluation by the Goodyear Compound Development Department; results reported herein, unless otherwise identified, were obtained by Goodyear.

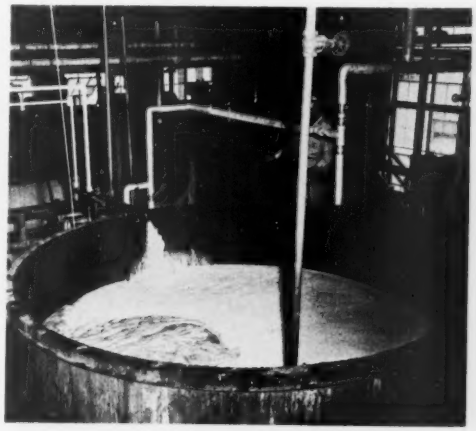
Early Background

From World War II until the latter part of 1950, research and development efforts were logically concentrated on improving the quality of synthetic rubber rather than enlarging the supply, but during the current heavy demand for rubber, any means of readily expanding or extending the supply is of considerable interest. Frequent references appear in the technical and patent literature, and in information obtained by groups cooperating in the RFC-sponsored research and development program, regarding the use of various softeners or oils either to facilitate the processing of rubber or to make more rubber compound from the same rubber hydrocarbon, or to achieve both these ends.

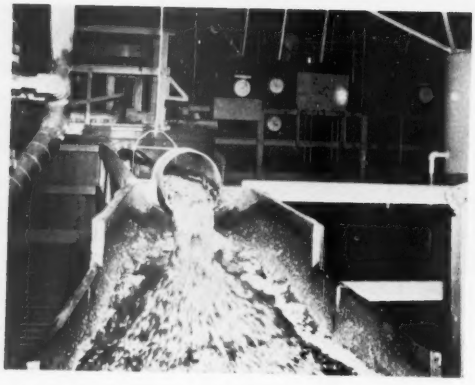
In 1934 W. F. Zimmerli and W. L. Semon obtained a patent *(1)* which they assigned to the B. F. Goodrich Company pertaining to a method of preparing rubber compositions in which 50 to 300 parts of softener was sorbed into unmasticated rubber. During 1943 and 1944 several other patents pertaining to softeners for rubber were assigned to Goodrich *(2, 3, 4)* which mentioned that the softener could be incorporated by various means including milling or mixing into the dry rubber or adding it to a solution, emulsion, or dispersion of the rubber.

Certain early work indicated that polymer of high molecular weight is capable of producing vulcanizates of improved dynamic properties. In March, 1943, Gehman and Field *(5)* described the separation of natural rubber and GR-S into various molecular weight fractions and evaluation of their respective dynamic properties after vulcanization. In each case the highest molecular weight fractions exhibited the highest resilience.

In 1945 KixMiller and Weidlein *(6)* reported that oil treatment rather than heat-softening had been used as an alternative method of plasticizing German Buna S. (Buna S, which was polymerized to a very high viscosity, was normally compounded into end-products after heat-softening.) It was reported that improved cut resistance was realized by preparing an unmodified tough polymer and then softening it by an oil treatment which consisted of swelling the rubber at room temperature with about 30 parts of mineral oil. The type of oil used was a fraction boiling at 200 to 300°. The tensile strength of the polymer was not appreciably affected and the rubber was said to be particularly useful for carcass stocks.



At this stage of production the oil emulsion is transferred from the preparation stage for storage prior to addition to the latex.



This view shows the slurry of oil-masterbatched polymer as it flows from coagulation.

Ludwig et al, in September, 1945, discussed various oils and petroleum derivatives as extenders for GR-S *(7)*. It was stated that extenders may not only serve to increase the volume of end-product that can be manufactured from a given quantity of GR-S, but in many instances can even improve the quality of the compound up to a certain point.

McMillan et al *(8)*, in August, 1947, showed that passenger car tire treads could be compounded from GR-S with as much as 19.5 parts of softener and 60 parts of carbon black and yet maintain tread wear substantially equal to the control compounded with 9 parts of softener and 45 parts of black.

In 1949, Rostler et al presented data concerning extender component classes such as asphaltenes, nitrogen bases, and saturated and unsaturated hydrocarbons in proportions of 15 to 40 parts in GR-S compounding. The use of these extenders in such proportions showed little detrimental effect on physical properties of the compound in many cases *(9)*.

In November, 1949, Juve and March discussed the effect of high loadings of carbon black and softeners on low-temperature flexibility and other physical properties of GR-S. As much as 25 parts of softener and 75 parts of black was used without appreciable decrease in physical properties under some conditions *(10)*.

Softener oils and other plasticizers have been used in compounding latex, both natural and synthetic, for some years. One of the reasons for adding such compounding agents is to decrease the viscosity of the polymer, especially when the original viscosity is high as in natural rubber and in Type III GR-S latex. It also is well known that the properties of Butyl tube stocks were substantially improved by the use of a high viscosity Butyl rubber to which considerably increased amounts of processing oil were added, as compared to use of a lower viscosity polymer with less processing oil. In certain trade booklets, the use of rubber processing oil as an elasticator to improve the resilience of GR-S is mentioned, and compounding formulations are given for the use of as much as 60 parts of softener oils as extenders in synthetic rubber compounds *(11, 12)*.

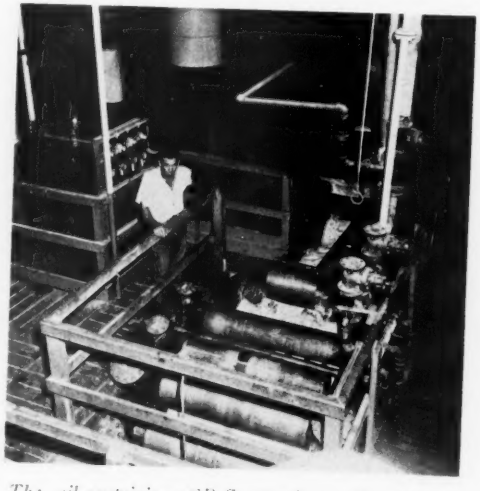
In July, 1949, Svetlik reported the preparation of rubber masterbatched in the latex form with 10, 25, and 50 parts of softener, and the evaluation of variable black and softener quantities in a 14° F. polybutadiene elastomer with 10, 20 and 30 parts of softener used in the compounds *(13)*.

In November, 1949, the masterbatching of 41° F. copolymer latex with 10, 25, and 50 parts of softener was reported. The Mooney (ML-4) of the original copolymer, 155, was reduced respectively to 135, 17, and 19 by the increasing amounts of softener which were added *(14)*.

In March, 1950, McMillan et al evaluated X-485 GR-S cold rubber compounded with 0 to 26 parts of Dutrex 6 rubber processing oil and 40 to 65 parts of HAF black. It was concluded that the total loading of cold rubber could be increased greatly with no marked effect on the vulcanizate properties and with improvement in processing *(15)*.

From October 2, 1946, to January 1, 1947, the Government Tire Test Fleet *(16)* at San Antonio, Texas, road tested tires built with GR-S of 97 ML-4 viscosity mixed with 17 parts of softener. This compound showed a tread wear rating 26% better than the control, and was equivalent in tread cracking resistance. The experimental polymer was made by the Copolymer Corporation and the tires were manufactured by the Lake Shore Tire and Rubber Company (now the Armstrong Rubber Mfg. Co.).

From October 13, 1947, to November 17, 1947, the Government Tire Test Fleet tested tires built with cold rubber of various viscosities and with proportionately higher softening oil content. The raw cold rubber was prepared under the Government research program by the Phillips Petroleum Company pilot plant and was built into tires by the Armstrong Rubber Manufacturing Company. A specimen of cold rubber polymerized to a Mooney of 105 ML-4 at a temperature of 41° F. was compounded with 20 parts of softener oil (equal parts of Circosol and Paraflux) compared to only 2 parts of softener for 45 ML-4 polymer. The higher-Mooney, higher-oil compound showed a tread wear rating of 107 compared with 105 for the 45 Mooney stock. The physical property tests showed the high-oil, high-Mooney stocks to exhibit lower modulus, lower hardness, similar tensiles and high elongation compared to low-oil, normal-Mooney stocks *(17)*. Other Government tire tests showing good tread wear for high-Mooney oil-softened polymers were run in 1948 and in 1949.



The oil-containing GR-S crumb is filtered and washed at this stage of production.

Recent Developments

In November, 1950, Gehman and D'Ianni reported *(18)* on cold rubber compounds containing 5, 10, 15, and 25 parts of Paraflux, respectively, incorporated by milling. Carbon black loadings were increased proportionately as follows: 40, 50, 60, 75 parts. The modulus, percent set, and stress-relaxation were relatively unaffected by increased softener loadings when the carbon black proportion was correspondingly increased as noted.

Cold rubber would appear better adapted to the use of high proportions of softener and carbon black because it is a higher quality elastomer than regular GR-S (hot rubber). However, a high-Mooney hot GR-S known as GR-S 85 (recently superseded by GR-S 86), which has been produced for some years in the RFC plant operated by the U. S. Rubber Co., can be used for such transportation items as tire treads and recaps when compounded with high proportions of rubber processing oils. In a Government tire test in 1950 *(19)*, 100-Mooney GR-S 85 when compounded with 22 parts of softener oil gave a better tread wear rating than regular GR-S (50 Mooney) compounded with only 9 parts of softener oil. Synthetic rubber mixed with carbon black, known as black masterbatch or black GR-S, has been in production in the Government plants for several years, for the convenience of the rubber processing industry.

The combined advantages of these developments are obtained by adding to tough high-Mooney cold rubber suitable rubber processing oils and carbon blacks, as desired, during GR-S manufacture. These new products, in the oil-masterbatch form and in the oil-black masterbatch form, are manufactured similarly to black masterbatch rubber. The viscosity of standard GR-S is so adjusted by the addition of modifier as to achieve a viscosity of approximately 50 ML-4 when the polymerization is stopped at the desired conversion. High viscosity rubber, such as GR-S-86 (105-ML-4), is more difficult to process in tire plants, but can be handled by the incorporation of much larger than usual proportions of rubber processing oil.

By introducing the oil into the rubber in the latex form, analogous to the carbon black latex masterbatching process, this mixing step can be transferred from the tire plants into the GR-S plants. Furthermore, in this case, the mixing is made considerably easier because the GR-S plants are better equipped to handle the mixing of liquid oils with rubber latex than the tire factories are to mix liquids with solid polymer.

In practice, the rubber processing oil is emulsified with an oleate or rosin soap in water and mixed into high Mooney stripped latex just before the creaming and coagulation step. [The regular GR-S process has been described by Soday *(20)* and the manufacture of cold rubber by Shearon et al *(21)*.] Pilot plant tests showed that with the oil introduced in this manner a stable colloidal system was obtained which presented no unusual problem in pumping, short-term storing, coagulating, washing, drying and baling. Acetone or ethanol-toluene-acetone extracts of such masterbatches gave results which agreed closely with calculated values, indicating no appreciable loss of plasticizer in the finishing operations.

After the process had been thoroughly proved by pilot plant development work and the product found satisfactory in laboratory and tire tread wear tests, the production of such polymers was undertaken at the Houston-Rubber Reserve plant. The polymerization recipe employed for X-628 consists of a sugar-free iron pyrophosphate Redox system utilizing a mixture of rosin and fatty acid soaps as emulsifier. The amount of tertiary C_{12} mercaptan (Sulfole) modifier required

TABLE I—PHYSICAL DATA ON LATEX MASTERBATCHED HIGH-MOONEY HIGH-OIL COLD RUBBER TREAD STOCKS
(All cures at 275° F.)

		71 MS-4 Cold GR-S MB with 25 parts of			Standard Cold GR-S Control
		Para-flux	Circosol 2-XH	Sundex 53	
Parts HAF Black		62.5	62.5	62.5	50
		Stress-Strain			
300% Modulus psi	40′	1500	1050	1100	875
Tensile Strength	40′	3200	3050	3300	3050
% Elongation	40′	500	590	590	700
Hot Tensile	40′	1690	1455	1540	1455
Hot Elong.	40′	465	505	516	550
16 Hrs. Air Bomb Aged:					
300% Mod.	40′	1450	1450	1500	1500
Tensile	40′	2450	1900	2200	2650
% Elong.	40′	470	370	430	500
		GR-S Tear			
Cold	40′	265	345	387	392
Hot	40′	191	200	168	245
		Goodyear-Healy Rebound			
Cold	55′	56.5	60.5	60.0	57.5
Hot	55′	71.8	71.8	71.2	68.5
		Goodrich Flexometer			
Shore	55′	63	59	60	58
	95′	65	60	62	59
% Set	55′	2.1	3.6	4.5	5.3
	95′	1.6	1.9	2.0	2.1
S. Comp.	55′	.159	.215	.198	.225
	95′	.157	.186	.173	.217
Temp. Rise	55′	53	55	59	61
	95′	53	48	52	56
		Ring Abrasions (cc. loss)			
	55′	4.10	3.41	3.40	5.78
	95′	4.00	3.15	3.70	5.70
		Pierced Groove Flex			
Original	40′	140	240	240	240+
Hot	40′	21	21	27	34

to obtain the desired raw polymer viscosity (MS-4 of 65-75) was about 0.10 part, per 100 parts of monomers, for 60% conversion at 40 to 43° F. Prior to salt-acid coagulation, the latex was blended with a 50% aqueous emulsion of a rubber processing oil prepared with 2 parts sodium oleate per 100 parts oil, in such proportion as to give a product containing 25 parts oil per 100 parts GR-S. X-629 was prepared in exactly the same manner, but with the addition of 50 parts Philblack O per 100 parts GR-S. No difficulty was encountered with subsequent processing steps in the polymer plant.

The Mooney viscosity specification was set at the point which would give a gel-free polymer of the highest molecular weight. The following data on Mooney viscosity and dilute solution viscosity of some cold rubber samples examined are of interest:

	Mooney Viscosity (ML-4)	Dilute Solution Viscosity	Gel Content *
1	46	1.63	Negligible
2	112	3.05	Negligible
3	122	3.24	Negligible
4	130	3.14	9

* As determined by insolubility in benzene.

Line 1 is typical of conventional cold rubber; lines 2 and 3 are typical of the high Mooney type employed for oil masterbatching.

From February 21, 1951, when the oil-masterbatched GR-S (X-628) and oil-black masterbatched GR-S (X-629) were announced by RFC *(22)*, until June 1,

TABLE II—EFFECT OF OIL-MASTERBATCHING ON MOONEY AND DSV

Material	ML-4 visc.	Gel %	DSV (.25% in benzene)
A. Cold Rubber (X-478)...	59	0	1.92
B. High-Mooney cold rubber	126	1	3.20
C. Circosol 2XH oil.....	——	—	0.05
D. Sundex 53 oil.....	——	—	0.05
E. 100 parts B + 36 parts C	55	1	2.25
F. 100 parts B + 36 parts D	42	2	2.19

TABLE IV—OIL MASTERBATCHING VARIOUS VISCOSITY COLD RUBBER WITH 25 PARTS OF VARIOUS OILS

Oil	Polymer Raw Mooney ML-4 Original	Oil Masterbatched
Circosol 2XH	140	77
OCL-2B	140	94
Circosol 2XH	103	60
Paraflux 2016	103	60
Sundex 53	103	52
Dutrex 7	103	49
Circosol 2XH	88	43
Dutrex 7	88	45

over 5 million pounds gross of X-628 and over 3 million pounds gross of X-629 were produced in the GR-S plant operated by Goodyear for RFC at Houston, Texas. The oil which has been used in these products to date is Circosol 2XH.

In Table I are presented data for tread stocks compounded with 62.5 parts of Philblack 0 and a high (71 MS-4) Mooney cold rubber latex masterbatched with 25 parts of Paraflux, Circosol 2-XH, and Sundex 53 rubber processing oils. A comparison is made with standard cold GR-S (GR-S-100) compounded with 50 parts of black. The oil-enriched polymers compare favorably with the control generally, and appear superior to the control with respect to rebound values, and temperature rises as measured by the Goodrich flexometer. The improvement in resilience appears to be definite, and for this reason these polymers are also being studied for application in tire carcass stocks.

Passenger car tire tests have been run in Akron and Texas on two-way treads containing pilot plant high-Mooney cold rubber masterbatched with the three oils. Tread wear and tread cracking were equal to those obtained with the cold rubber control, with an average tread wear rating in eight tests of 102, as compared to 100 for the control. These tire tests are substantially confirmed by a recent test run with production polymers on the Government tire test fleet; after 16,000 miles, X-628 oil-masterbatched cold rubber showed a tread wear rating of 100 compared with 100 for the standard cold rubber control; no cracking tendency was observed with either polymer.

Apparently, what the rubber processing oil does in the oil masterbatch process is to substitute for low-molecular-weight butadiene-styrene polymer, which serves a similar plasticizing purpose in regular GR-S. When it is considered that a certain amount of butadiene-styrene polymer is being replaced by a much more readily available petroleum material which does the same job, there is an obvious economy involved. The oil-masterbatched GR-S is being made available to consumers at a price which reflects its GR-S content proper at the regular price of GR-S, and the oil content at the price of the oil. Thus not only is additional apparent rubber allocated to the consumer, but he is enabled to obtain it at a lower over-all cost. Furthermore, the proportion and type of oil is not necessarily limited to that used to date in X-628.

Table II shows Mooney viscosity (ML-4), gel, and dilute solution viscosity (DSV) for cold rubber (X-478), high viscosity cold rubber, and the latter extended with 36 parts of one or the other of two rubber processing oils, added by oil-masterbatching the latex. The molecular weight of GR-S is related to the DSV, and the molecular weight distribution can be indicated from the DSV of polymer fractions precipitated from benzene solution by incremental additions of methanol.

Table III shows the DSV distribution for X-478, the high viscosity cold rubber, and the Circosol oil-masterbatched sample in Table II. Data for Tables II and III were supplied from the Government Laboratories, University of Akron, under date of May 18, 1951 *(23)*.

The processing oils which have been tested vary from a considerable content of asphaltic materials, such as Paraflux, through a highly aromatic substance like Sundex-53, to a predominantly naphthenic composition such as Circosol 2XH.

McKenzie et al *(24)* reported in April, 1951, laboratory tests of Dutrex 7 aromatic oil and Exoil OCL-23 asphaltic oil compared with Circosol 2X and Paraflux 2016 for decreasing the Mooney of three high viscosity

TABLE III—FRACTION, % OF GROSS POLYMER

DSV	A X-478	B High-Mooney	E Oil MB
0-1	27	15	40
1-2	28	17	13
2-3	19	13	11
3-4	22	11	9
4-5	4	15	9
5-	0	29	18
	100	100	100

TABLE V—OIL-MASTERBATCHING OF 133 ML-4 COLD RUBBER WITH 25 PARTS OF PROCESSING OILS

	Raw ML-4	Paraflux	Circosol 2XH	Nevoil
Original polymer	133		133	133
Oil MB	72		56	83
Properties of Oil MB Black Compounds,* 30' at 307° F.				
300% Modulus, psi.....		2050	2450	3040
Tensile, psi		3200	3310	3600
Elongation, %		465	400	355
200° F. tensile, psi		2010	1870	2300
Aged 24 hr. at 212° F.:				
300% Modulus, psi		2620	——	——
Tensile, psi		2930	2980	3425
Elongation, %		345	280	275

* 62.5 parts HAF black, 125 parts MB (100 polymer, 25 oil).

cold rubber samples by latex masterbatching. The results are shown in Table IV.

In May, 1951, Brennan *(25)* reported laboratory tests with a coal-tar-base oil, Nevoll, compared to Paraflux and Circosol 2XH in oil-masterbatching of cold rubber. Selected data are given in Table V.

Summary

The addition of oils to high molecular weight synthetic rubber, during the latex stage in GR-S production, yields a packaged product, oil-masterbatched GR-S, which offers sizeable extension of the rubber hydrocarbon with minimum inconvenience to end-product manufacturers. Road tests indicate that tire qualities are not sacrificed. Laboratory tests indicate that dynamic properties are somewhat improved; this improvement may be due to a better retention of molecular structure in the polymer to the extent that oil-diffusion replaces mechanical work in factory processing.

ACKNOWLEDGMENT

This paper was prepared under the sponsorship of Office of Rubber Reserve, R. F. C., in connection with the Government Synthetic Rubber Program.

SPECIAL NOTE

Trade names and trade-marks are used in the text of this paper as a matter of convenient reference, with full recognition of the property rights of the owning companies.

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Said to assure positive performance and a much greater operating force than is possible with a large direct-connected solenoid, a new line of **Solenoid-operated single plunger valves** has been introduced by C. B. Hunt & Son, Inc., Salem, Ohio. They are said to reduce the current requirement, impact and maintenance.

Featuring a variation on the sealing principle which is employed in the company's high pressure valves, an inexpensive **manual 4-way valve** has been developed by Barksdale Valves of Los Angeles, Calif. The new unit controls 150 psi pressure and handles liquid pressures up to 1,000 psi. It is available in pipe sizes from ¼ to ¾-inch.

The usual wood pallets being used in many plants can now be quickly adapted for tiering by the use of a few simple parts known as the **Palteam,** a development of the Paltier Corp., 53 West Jackson Blvd., Chicago 4, Ill. Palteam is described as a pair of tiering horses which may be assembled to any standard 3-stringer wood pallet.

Addition of a **momentary contact double solenoid-operated 4-way valve** to its line has been announced by Mechanical Air Controls, Inc., Detroit 8, Mich. The new valve is intended for application in the operation of double-acting low pressure hydraulic or air cylinders where pressure is held on one side of the cylinder for a period of time.

The availability of a new, improved **Load-Mobile Electric Lift Truck** has been announced by the Market Forge Co., Everett, Mass. Improvements include a new high-low switch for easier maneuverability in close quarters, use of spring-mounted casters to increase stability, freer use of sealed ball-bearings in the control system, and use of a heavy roller chain to operate the brake instead of an enclosed cable.

Division of Rubber Chemistry, A. C. S., Meets in New York on September 5-7

PLANS have been completed for the 59th Meeting of the Division of Rubber Chemistry of the American Chemical Society, which will be held in New York City on September 5, 6 and 7 in conjunction with the 75th Diamond Jubilee Meeting of the parent society. As usual, headquarters for the Rubber Division will be maintained at the Hotel Commodore and all divisional activities will take place at that hotel. Room reservations are now being accepted by the hotel.

The meeting of the Rubber Division, following the policy dictated by the parent society for its jubilee celebration, will feature the presentation of five symposiums, including: (1) Dynamic Properties of Rubberlike Materials; (2) Ozone Cracking; (3) Preparation of Synthetic Rubber; (4) Properties of Synthetic Rubber, and (5) Natural and Synthetic Latex. Each symposium will be held under the chairmanship of an outstanding technologist in the field. In all, thirty-five technical papers will be presented.

In addition, the meeting will feature a luncheon session on Wednesday, September 5, of the 25-Year Club, a business session on Thursday morning, September 6, presentation of the Charles Goodyear Lecture by Dr. W. C. Geer on Thursday afternoon, and the divisional banquet on Thursday evening. The annual Suppliers' Cooperative Cocktail Party will precede the banquet. No technical session will be held on Wednesday afternoon, September 5, since all members of the A.C.S. are invited to attend the general meeting of the society which will be held with special ceremonies that afternoon.

Abstracts of the technical papers scheduled for presentation, together with the authors and their company connections, follow:

Program of the
DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY
Hotel Commodore, New York, N. Y.
September 5-7, 1951

Wednesday Morning—September 5

9:00 A.M.—Registration.
10:00 A.M.—Symposium on Compounding.

Wednesday Afternoon—September 5

12:30 P.M.—Twenty-Five Year Club Luncheon.
2:00 P.M.—General Meeting of the American Chemical Society.

Thursday Morning—September 6

9:00 A.M.—Symposium on Dynamic Properties of Rubberlike Materials.
11:40 A.M.—Business Meeting.

Thursday Afternoon—September 6

2:00 P.M.—Goodyear Lecture.
2:45 P.M.—Symposium on Ozone Cracking.

Thursday Evening—September 6

6:00 P.M.—Suppliers' Cooperative Cocktail Party, Hotel Commodore.
7:00 P.M.—Divisional Banquet, Hotel Commodore.

Friday Morning—September 7

9:00 A.M.—Symposium on Synthetic Rubber. I. Preparation of Synthetic Rubber.
10:15 A.M.—Symposium on Synthetic Rubber. II. Properties of Synthetic Rubber.

Friday Afternoon—September 7

2:00 P.M.—Symposium on Latex: Natural and Synthetic.

ABSTRACTS OF PAPERS

Wednesday Morning—September 5

Symposium on Compounding

A. E. Juve, Presiding

10:00 A.M.—1—Introductory Remarks. J. H. Fielding and A. E. Juve.

10:05 A.M.—2—The Compounder in the Rubber Industry. *B. S. Garvey, Jr. (Sharples Chemicals Inc., Wayne, Penna.).*

This is a review paper dealing with the scope of the field of compounding, the role of the compounder in the industry, the manner in which he works, and the materials which he employs.

10:35 A.M.—3—The Significance of Breakage of Carbon-Rubber Networks by Applied Stress. *A. F. Blanchard and D. Parkinson (Dunlop Rubber Co., Birmingham, England).*

The work was undertaken in order to throw more light on the carbon reinforcement of rubber by means of studying reinforced rubber when it has been softened by the application of stress in the manner first described by Mullins and afterwards by the present authors. It was hoped that this approach would promote a clearer understanding of the nature of the attachments which are presumed to exist between carbon particles and rubber molecules.

To facilitate quantitative estimates of the changes that occur during prestressing and their interpretation a semi-empirical mathematical expression has been derived which under certain conditions fits the stress-strain curve of reinforced rubber. The equation contains two parameters, G and μ, which depend on the quantity of carbon in the rubber and the degree of softening due to application of stress.

The parameter G is roughly equivalent to the modulus given by the equation representing the simple statistical theory of elasticity of rubberlike polymers and the extension factor μ is a rough measure of the deviation from theoretical behavior for a given extension. The presence of carbon black in the rubber increases the modulus G and also results in a departure from theoretical behavior which becomes very large as the extension is increased. This deviation may be interpreted as a result of

limited extensibility of the rubber-carbon network under conditions where few bonds are broken.

Results so far obtained during the present study support the view that the stiffening of rubber by carbon black can be attributed mainly to linkages through carbon particles resulting from carbon-rubber bonds and assisted by any coherent chain structure which may be present. It is thought that the softening of reinforced rubber with stress is primarily due to rupture of carbon-rubber attachments and owes little to breakage of contacts between particles of carbon. A relatively small number of weak linkages stiffen the rubber at low elongations and a small number of strong linkages stiffen the rubber at high elongations. Heat treatment under certain conditions of rubber-channel black stocks appears to increase the relatively small number of strong bonds so that rubber made from such heated stocks is abnormally stiff at high extensions although of normal stiffness at low extensions.

11:00 A.M.—4—A Study of Carbon Black Dispersion and Reinforcement. *E. M. Dannenberg (Godfrey L. Cabot, Inc., Boston, Mass.).*

The most generally recognized characteristic of a good reinforcing filler for rubber is small particle size. In the case of carbon blacks, it has been shown by numerous investigators that reinforcement is enhanced as the particle size decreases. Since particle size cannot exert its influence on reinforcement unless the filler particles are dispersed or at least substantially wetted by the rubber matrix, it is necessary to investigate the importance of these factors. A mechanistic explanation of the reinforcement phenomenon must be based on an understanding of the morphology of the carbon black-rubber system. This study has attempted to determine to what extent changes in the degree of dispersion are reflected in reinforcement, and the minimum degree of dispersion necessary for its development.

The dispersion of a high abrasion furnace black in natural rubber, "cold" GR-S, Butyl, nitrile, and neoprene was varied by controlling Banbury mixing times and speeds. Heat tempering of the carbon black-rubber masterbatch followed by cooling and remilling was also used to obtain the best possible carbon black dispersions. Electrical resistivity measurements and electron microscope studies indicated that large differences in the degree of carbon black dispersion for the various stocks were obtained. Abrasion loss and other physical test data showed that in some instances a low degree of reinforcement was obtained with very poor dispersion. In these cases the dispersion was so poor that large unwetted aggregates were clearly visible in the unvulcanized stocks. Essentially, however, full reinforcement was achieved with a minimum of mixing. Judged by electrical resistivity, the degree of dispersion in these vulcanizates would still be classified as poor. Further mixing to give better dispersions did not result in a higher level of reinforcement.

These results seem to indicate that in order to develop the full reinforcing effect of carbon blacks it is necessary to disperse the aggregates to a degree consistent with the formation of a substantial amount of interfacial surface. Further improvements in dispersion which result in relatively small increases in interfacial surface have only minor effects on the level of reinforcement.

These results also demonstrate that the reinforcing effect of carbon black is relatively insensitive to the degree of its dispersion. It is of practical interest to note that for this reason the quality of rubber products containing carbon blacks is not influenced greatly by the use of widely different processing equipment and mixing techniques.

11:23 A.M.—5—Some Properties of Butyl Rubber-Carbon Black Systems. *F. P. Ford and A. M. Gessler (Standard Oil Development Co., Linden, N. J.).*

The properties of Butyl rubber-carbon black systems have been investigated in both the unvulcanized and vulcanized state. Several different types of furnace and channel black have been considered in this work. In studying unvulcanized systems attention was given first to the processing behavior of such systems in different degrees of dispersion. The degree of dispersion was determined by photometry of dilute suspensions, plastometric methods and by means of the electron microscope. The effect of varying dispersion was determined by such methods as extrusion and calendering.

A second phase of the study of unvulcanized systems was directed towards a better understanding of the nature of reinforcement of Butyl rubber by carbon black. In this work use was made of rheological tests, photometry, bound rubber determinations and electrical properties. With such techniques, observations were made as to the effect on these systems of aging and temperature and pressure changes as well as variations in mechanical dispersion.

In evaluating the vulcanizate properties of these mixtures, use was made of several specialized procedures as well as the more conventional rubber tests. Equilibrium modulus, internal viscosity and damping effects were determined with such procedures. The effects of various processing techniques were studied in this manner. This work has indicated new methods for the improvement of important properties of Butyl rubber compounds.

11:45 A.M.—6—Estimation of the Wear Resistance of Vulcanized Elastomers. *J. C. Burns and E. B. Storey (Polymer Corp., Ltd., Sarnia, Ont., Canada).*

The lack of a satisfactory laboratory measure of the wear resistance of vulcanized elastomers has delayed the development and acceptance of new elastomers for tire service. The ethanol-toluene extraction method (Griffith et al) offered a means of obtaining a closer relation between laboratory and service wear tests. It has been observed that this method did not rank GR-S and low temperature GR-S vulcanizates in the order obtained in road wear tests.

Room temperature immersion of tread vulcanizates in ethylene dichloride, or acetone, resulted in a significant decrease in abrasion resistance, but less than that obtained by the ETA extraction treatment. A specific percent decrease in abrasive resistance was obtained for each treatment over a range of carbon black loadings.

The order of abrasive resistance of GR-S and low temperature GR-S vulcanizates could be changed by reducing the size of the abrasive grit, and a 4/0 Garnet paper indicated a lower rate of wear for the low temperature GR-S vulcanizate.

When a steel screen was employed with the National Bureau of Standards Abrader, in place of the abrasive paper, the rate of wear was reduced by a factor of about 50. The wear resistance on the screen increased with the state of cure of the vulcanizate and a maximum value was observed at a cure slightly beyond the optimum tensile cure. Low temperature GR-S vulcanizates showed the higher maximum wear resistance over a range of wire and mesh sizes and, also, on a metal grid surface.

The wear resistance of these two elastomers decreased, and became more nearly equal, with an increase in the softener content of the vulcanizate. A low wear resistance value was obtained when surface deterioration of a natural rubber vulcanizate produced a black smear on the metal screen.

The effect of different grades of carbon black on the wear resistance of tread-type vulcanizates was in the same order as that reported for road wear tests.

12:08 P.M.—7—The Effect of Metallic Oxides on the Vulcanization of Neoprene Type W. *F. H. Fritz and L. R. Mayo (E. I. du Pont de Nemours & Co., Wilmington 98, Del.).*

Neoprene Type W, to a greater extent than other neoprenes, requires the use of organic accelerators to supplement the conventional metallic oxide (zinc oxide, magnesia) curing agents in producing optimum vulcanizate properties. The basic curing system, therefore, consists of at least three components which, when varied, produce compounds differing considerably in behavior. This paper reports the results of a further investigation directed toward the more efficient use of this inherently flexible vulcanization system. It is based on observations of variations in processing safety, rate of cure, state of cure, and aging in Neoprene Type W compounds that occur when the type and concentration of zinc oxide and magnesia are varied in the presence of several different accelerators.

The effect of varying the type and amount of metallic oxides on processing safety (as judged by the Mooney scorch test) differs greatly with the accelerator employed. Stocks accelerated with 2-mercaptoimidazoline (NA-22), p,p'diaminodiphenylmethane (Tonox), or diphenylguanidine-sulfur are very insensitive to such variations. On the other hand, compounds accelerated with the diortho-tolylguanidine salt of dicatechol borate (Permalux), salicylic acid (Retarder W), or 2-mercaptothiazoline (2-MT) - sulfur are markedly influenced by these changes.

In the presence of this latter group of accelerators, particularly Permalux, improvements in processing safety are obtained by increasing the concentration of magnesia and decreasing the zinc oxide as well as by selecting specific grades of these oxides. Safety is promoted by the use of either French Process or specially washed American Process zinc oxide in combination with an extra light calcined magnesia.

In spite of the substantial gain in processability realized by these adjustments in compounding the rate of cure at conventional temperatures, e.g., 153° C. (307° F.), is not seriously reduced and the state of vulcanization (as judged by modulus, compression set, and resilience), attained in reasonable curing times is fully equivalent to that reached with more scorchy combinations.

This method of obtaining a desirable balance between processability and rate of vulcanization is particularly advantageous in carbon black loaded stocks. A reduction of zinc oxide concentration in the normal range moderately impairs resistance to high temperature aging; however, no adverse effect is observed on samples exposed in the 70° C. oxygen bomb or to weathering in direct sunlight.

The broad conclusion is drawn that the adjustment of the amount or type of zinc oxide or magnesia, in the presence of a "sensitive" accelerator such as Permalux, is a valuable technique in producing well-balanced compounds of Neoprene Type W.

Thursday Morning—September 6

Symposium on Dynamic Properties of Rubberlike Materials

J. W. Liska, Presiding

9:00 A.M.—8—Introductory Remarks, J. H. Fielding and J. W. Liska.

9:10 A.M.—9—Dynamic Properties of Rubber. ***Robert S. Marvin (National Bureau of Standards, Washington, D. C.).***

Rubber is one example of a class of materials which are known as viscoelastic, since they exhibit both viscous and elastic properties. As a result, only part of the energy required to deform a sample is stored and returned on release of the deforming force, while the remainder is dissipated as heat.

Viscoelastic properties may be expressed by several theoretically equivalent functions, including the creep function, the stress-relaxation function, and the dynamic modulus function. The dynamic modulus function, a complex or two-part function depending on both frequency and temperature, can be measured directly only by experiments which employ steady-state sinusoidal stress and strain. It can, however, be calculated with varying degrees of approximation from experimental determinations of the period and attenuation of a mass-spring system undergoing free, damped vibrations, where the rubber sample provides the "spring"; from measurements of wave-length and attenuation of transverse, longitudinal, or compressional waves in a rubber sample; or from measurements on a "vibrating reed" sample.

The dynamic modulus function is dependent on frequency, although in certain ranges of temperature and frequency the change is so gradual that it has not been detected in some experimental investigations. The qualitative equivalence of temperature and frequency (decreasing the temperature affects the modulus in the same way as increasing the frequency) has been realized for some time. Recently Ferry [*Journal of the American Chemical Society*, Vol. 72, p. 3746 (1950)] has developed a quantitative expression for this equivalence which is supported by experimental determinations over a wide frequency range.

The prediction of performance of rubber articles based on dynamic tests is complicated by the fact that in most applications the rubber is subjected to a very complicated system of strains, and also by the presence of fillers of various types. One factor which has made interpretation and comparison of various results difficult has been the rather poor reproducibility attained in many types of dynamic measurements, and another has been the failure to maintain sufficiently close temperature control in some experiments. With the recent advances in the techniques of making such measurements, and the improved understanding of the effects of frequency and temperature, it seems reasonable to expect that the next few years will see a great advance in the application of dynamic measurements both to the determination of the effects of structure on mechanical behavior and to the testing of rubber stocks and products.

9:45 A.M.—10—Correlation of Dynamic and Static Measurements of Rubberlike Materials. ***R. D. Andrews (Dow Chemical Co., Midland, Mich.).***

Dynamic and static measurements on rubberlike materials can be related in terms of a generalized Maxwell model which is assumed to represent the mechanical behavior of the system, the individual characteristics of the system being expressed by the nature of the relaxation time distribution of the model.

Such properties as dynamic modulus and dynamic viscosity measured in experiments involving sinusoidal vibrations, and static modulus measured in experiments of relaxation of stress at constant strain, can be expressed by integrals involving the distribution of relaxation times. The distribution of relaxation times can therefore be calculated from experimental data of this sort by suitable mathematical methods. Because of the complexity of such calculations when carried out rigorously, the use of approximate methods is often desirable.

A number of useful approximate relations can be derived by consideration of a "logarithmic box" distribution of relaxation times. The behavior of systems characterized by distributions representing extreme deviations on both sides of the box distribution has also been investigated, for comparative purposes. Other approximations and additional information can be obtained by an analysis of the mathematical structure of the integrals relating the distribution of relaxation times to the observed static and dynamic physical properties. A frequently used approximation is that in which the value of the distribution function of relaxation times, in terms of logarithmic time, is assumed to be numerically equal to the slope of the static modulus curve plotted versus logarithmic time, or to the slope of the dynamic modulus curve plotted versus logarithmic reciprocal frequency. The possibility of deriving correction terms to these relations, in order to obtain more exact expressions, will be discussed.

An examination of published data in which correlations of static and dynamic experiments are attempted on the basis of this general theory shows that reasonably successful correlations are obtained. As illustrations, comparisons of static and dynamic modulus data on polyisobutylene by the author, predictions of dynamic viscosity of vulcanized rubbers from relaxation (static modulus) data by Dunell and Tobolsky, prediction of free vibration behavior of vulcanized rubber from creep data by Kuhn and Kunzle, and prediction of dynamic behavior of various plastic materials from creep data by Lethersich will be described.

10:05 A.M.—11—Dynamic Mechanical Properties of Polyisobutylenes in the Audio Frequency Range. ***John D. Ferry (University of Wisconsin, Madison, Wisc.).***

The dynamic rigidities and dynamic viscosities of several fractionated and unfractionated polyisobutylene samples have been measured by a twin transducer from 25 to 4000 cycles/sec. over a large temperature range, in collaboration with E. R. Fitzgerald and L. D. Grandine, Jr. Reduced variables are employed to interrelate the frequency and temperature dependence and to obtain the dynamic rigidity and viscosity reduced to 25° C. over an extended frequency range. The distribution function of relaxation times is calculated from both the rigidity and the viscosity, and its dependence on molecular weight and molecular weight distribution is discussed. The relations of the distribution function to other types of time-dependent mechanical behavior are shown.

10:25 A.M.—12—Vibration Characteristics of Tread Stocks. ***K. E. Gui, C. S. Wilkinson, Jr., and S. D. Gehman (Goodyear Tire & Rubber Co., Akron 16, Ohio).***

Non-linear vibration characteristics, as evidenced by a dependence of modulus and internal friction on amplitude, are readily observed for tread stocks of both Hevea and synthetic rubbers in the mechanical range of frequencies. It can be shown in a number of ways that these effects are not due to tempera-

ture rise, although precise measurements of the effect are complicated by any temperature rise caused by the vibration.

The effects occur for stocks reinforced with a fine silica pigment or with high styrene resin and for higher loadings of pigments generally considered to be non-reinforcing. Therefore, they cannot be attributed to any unique feature of carbon black structure or dispersion. The pigment loading required for the same degree of non-linearity does depend on the particle size. Indications are that the non-linearity becomes pronounced when the thickness of the rubber films between the particles is comparable to the particle diameter. Unvulcanized tread stocks also are non-linear in vibration. Non-linearity occurs for vibrations both in shear and compression.

Measurements of the non-linearity for tread stocks over a range of temperatures suggest that the vibration elicits structural changes in the rubber analogous to those observed in the rheology of rubber solutions and raw rubber and that the nature of these structural changes can be interpreted by the rheological criteria of structure developed for non-Newtonian systems. In a sense, the case represents the inverse of the usual non-Newtonian system in that the structural changes occur in the deformed medium rather than in the dispersed particles. Experiments were made to try to evaluate in the usual way the importance of such recognized mechanisms for non-linearity as orientation, deformation, and breaking and reforming of bonds of the flow units.

The non-linear effects appear to be sufficiently large that they should probably be taken into account in any exact studies of the effect of modulus on tread wear and performance.

10:45 A.M.—13—Velocity and Attenuation of Ultrasonic Sound in Polymers. *J. L. Melchor, A. A. Petrauskas, and E. Guth (University of Notre Dame, South Bend, Ind.).*

A pulsed method for the measurement of the velocity and the attenuation of ultrasonic sound in solids has been developed and applied to polymers previously [Ivey, D. G., Mrowca, B. A., and Guth, E., *J. Appl. Phys.*, Vol. 20, p. 486 (1950)]. The experimental technique has been considerably improved and permits in its present form a precision of about 0.03 percent in the determination of the velocity of sound. The range of frequencies extended from 500 kc. to 10 mc. and the temperature was varied from 15° C. to 105° C. Both the frequency and the temperature range can be extended with minor modifications in the equipment and the liquid medium used. The high degree of precision was aimed at particularly in order to be able to observe possible breaks at the second order transition for polymers, in the velocity of sound versus temperature curve. Such breaks were reported in the literature [Protzmann, T. F., *J. Appl. Phys.*, Vol. 20, p 627 (1949)] to occur for commercial polymethyl methacrylate. These breaks shifted with higher frequency to lower temperatures. In the present work breaks were observed in the velocity of sound versus temperature curve but the breaks shifted with increasing frequency to higher temperatures. The attenuation has also been measured. The theoretical significance of the results and also of similar measurements on other rubberlike polymers will be discussed.

11:05 A.M.—14—A Study of High Polymeric Material by Ultrasonics. *G. I. Cathers, E. D. Bailey, A. M. Buchy and Emanuel Asness (Franklin Institute, Philadelphia 3, Penna.)*

The use of high frequency ultrasonics to obtain information concerning the liquid state of polymer and elastomer compounds has been reported. Due to the use of GR-S in the synthetic rubber program and to the gradual shift of the second-order transition point with composition of the copolymer, it was of interest to examine the ultrasonic method as a means of studying the butadiene-styrene copolymer system. A comparison of the ultrasonic behavior with the transition point was thus made possible. Some other polymers were also studied.

A major portion of the data was obtained through the use of diluted latex. The impedance match between water and rubber was sufficiently good to neglect the secondary scattering effect. A direct relation between the volume concentration and the absorption of ultrasonic energy was found to hold true at low concentrations. Attention was centered on measurement of absorption rather than on velocity due to the sensitivity of absorption to molecular structure. The frequency range extended from 2 megacycles to 90 megacycles. The temperature was also varied over a large range.

The absorption dispersion curves obtained over a temperature range were remarkably similar for all compositions and were comparable with the form for dielectric dispersion. Increase of the styrene content in the copolymer merely shifted the dispersion region upward on the temperature scale without affecting the maximum absorption markedly. The maximum absorption was changed by shift of composition in other copolymer systems; in the case of GR-S the maximum absorption was changed by vulcanization or by carbon black reinforcement. It was not dependent on molecular weight.

The dependence of absorption on the square of the frequency, usually obtained in the liquid state for a viscous process, was not found. The square law relation was approximately true on the high temperature side of the dispersion region; on the low temperature side the relation was nearly linear. Addition of solvent to polymer was found to be equivalent to increase of temperature. The relations between composition, frequency and temperature suggested that relaxational processes were involved. This was confirmed by the usual relation between frequency and the exponential function of reciprocal temperature. The model for the relaxational process is discussed.

The correlation between increase of the second-order transition point and the shift of the dispersion region suggests that the same relaxational processes may be involved in both. Other authors have observed a relation between rate of deformation and the temperature of transition. The ultrasonic dispersion region represents a transition from a glass-like to a liquid-like stage. Extrapolation of the ultrasonic dispersion temperature from the megacycle range to a rate of about 0.1 cps. approximates the second-order transition points.

Thursday Afternoon—September 6

2:00 P.M.—Goodyear Lecture by Dr. W. C. Geer

Symposium on Ozone Cracking

G. R. Cuthbertson, Presiding

2:40 P.M.—15—Introductory Remarks. J. H. Fielding and G. R. Cuthbertson.

2:45 P.M.—16—Static Exposure Testing of Automotive Rubber Compounds. *H. A. Winkelmann (Dryden Rubber Division, Sheller Manufacturing Corp., Chicago, Ill.).*

Deterioration of rubber products on outdoor exposure is due to the action of sunlight and ozone. Light energized oxidation produces a checked or crazed condition on the surface of the rubber. Ozone cracking results when rubber is exposed under strain. The type of cracking observed with ozone is not produced by other elements or materials normally present in the atmosphere.

Protection against ozone cracking under static conditions is provided by a wax film that continuously blooms to the surface. The character of the wax bloom is important. Ozone is responsible for cracking which appears during dynamic flexing. Waxes do not give protection against cracking in standard flexing tests as is the case on static exposure.

This study shows that there are many variables which influence the resistance of rubber products to ozone. The effect of processing, handling and curing of compounds has been noted. The selection of a polymer such as natural rubber, GR-S, neoprene or Butyl rubber has a marked influence on ozone resistance of automotive rubber products. Unless a polymer is handled and compounded properly good ozone resistance is not obtained. Microphotographs show that pigment dispersion and particle size play an important part in relieving internal strains and improving ozone resistance. The method of curing and molding, viz., extrusion, injection, compression and transfer molding, have been evaluated and show differences in weather aging. Rubber cured under strain cracks faster than when cured at rest. Manufacturing defects such as blisters, air traps, foreign matter and pigment agglomerates result in premature cracking.

Manganese, copper and iron salts in natural rubber and GR-S compounds have an adverse effect on ozone resistance in outdoor and accelerated exposure tests.

To obtain maximum uniformity the preparation and rating of

test samples has been made according to the test method adopted by the SAE-ASTM Technical Committee on Automotive Rubber. Preparation and treatment of samples before exposure has a marked effect on the results obtained.

Ozone cracking on outdoor aged samples can be duplicated in an ozone chamber. In outdoor exposure the effect of sunlight, ozone, heat and water varies seasonally in Florida, California, Detroit, Mich., and Chicago, Ill. Many tests and much good judgment must be exercised in correlating accelerated and outdoor exposure tests.

3:15 P.M.—17—Ozone in Los Angeles and Surrounding Areas. ***A. W. Bartel (U. S. Rubber Co., Los Angeles, Calif.) and J. W. Temple (U. S. Rubber Co., Detroit, Mich.).***

For some considerable time it has been apparent that rubber products exposed to the atmosphere in the Los Angeles area of California developed characteristic ozone cracking more rapidly than in most other parts of the United States.

With this problem in mind, certain apparatus was used to make daily tests for atmospheric ozone for a period of a year. Values obtained were high. Air samples also were taken outside of the Los Angeles area, in the desert and on the ocean, away from the congested and air polluted areas with similar results—high ozone content. Correlating this data with that of daily psychrometric reports and daily maximum temperatures, a definite pattern of atmospheric ozone and weather could be observed. The accumulated data are compared with information available from other areas, and confirm that the Los Angeles atmosphere, during the period of measurement, was relatively high in ozone.

In connection with investigations of "smog" in Los Angeles, there has been some discussion of the possibility that much of the cracking of rubber is due not to ozone itself but to peroxide compounds formed through reaction of ozone (or other oxidative systems) with unsaturated hydrocarbon contaminants in the industrial atmosphere.

To us, this postulate seems unlikely and unnecessary for the following reasons: Our analysis in Los Angeles proper, and in places remote from the city, showed apparent ozone concentrations of essentially the same order. We have found about the same order of rubber checking in both locations. We have trapped, by refrigeration, peroxide fractions of Los Angeles smog, and have been unable to induce any checking of rubber on exposure to this material.

3:35 P.M.—18—Crack Depth Analysis of Ozone Cracking Results. ***John S. Rugg (Gates Rubber Co., Denver, Colo.).***

Much attention has been focused in the last few years on the weathering resistance of rubber and synthetic polymers. Accelerated tests to determine the weathering and ozone resistance of these materials are rapidly coming into regular use. A major deterrent to wider use of this type of test and to complete utilization of weathering and ozone results is the lack of a satisfactory method of analyzing the data obtained.

There are many ways of analyzing the results of ozone and weathering tests; however, there are two in common use today. The time to initial cracking is determined visually, and photographs are made at certain time intervals for visual examination. The methods of ozone crack analysis now in use suffer from one or two disadvantages. They usually depend upon human judgment to determine the magnitude of test results or the method and equipment required to obtain the data are so cumbersome as to prohibit its use in every day testing.

An ideal method of ozone crack analysis is one which yields quantitative numerical results, is easily performed, does not require specialized or elaborate equipment and is independent of human error. Such a method is proposed in this paper.

A study was made of the change of the three ozone crack dimensions—crack length, depth, and number—with many conditions of exposure. This study shows that crack depth is a reliable index of the extent of cracking which takes place and it is the easiest of the three dimensions to measure. The crack depth may be plotted and used quantitatively as other experimental data are used. Measurement of crack depth is accomplished using a microscope of low power having a graded scale included in the field. A sectioned sample is examined by scanning the entire length and the longest cracks are considered.

In order to demonstrate the usefulness of this method separate studies were made of the variables commonly associated with ozone testing. Many of these variables have been reported previously in the literature but have not had the benefit of quantitative data. This paper shows the effect on crack depth of ozone concentration, exposure time, sample elongation during exposure, constant load during exposure, and constant deflection during exposure. The use of the crack depth analysis method in the above studies resulted in quantitative data which are easily plotted and which show clearly the effects obtained.

The method of analysis presented in this paper has proved very useful in performing studies of both ozone and weathering resistance and this method provides a reproducibility of results between separate tests and between different examiners which has been unobtainable in the past. This method is especially suited to compounding studies of ozone cracking because it shows, quantitatively, the difference between samples being independent of human judgment. This method is proposed for examination by others in the field as a means of improving ozone testing and making the results more reliable.

3:55 P.M.—19—The Effects of Temperature and Elongation on the Cracking of Rubber and GR-S in Ozone. ***G. R. Cuthbertson and D. D. Dunnom (U. S. Rubber Co., Detroit, Mich.).***

Determinations of the effects of elongation on the character of cracking in samples of rubber exposed to ozone have been reported by some of the early workers in the field. Some of the effects of temperature on the rate and character of cracking have also been reported; however, these data have not clearly shown the effects of the interaction of temperature and elongation on the character of ozone cracking.

In the present study, samples of natural rubber, standard GR-S and low temperature GR-S compounds were exposed to a constant concentration of ozone for four hours at several elongations and temperatures. Prints were made from the exposed samples by inking the sample surface and taking an impression on paper.

It was found that the natural rubber compound cracked at lower temperatures and elongations than either the standard or low temperature GR-S compounds. In addition, for each compound, it was found that for each temperature there existed an elongation below which no cracking occurred; this elongation is termed the "cracking threshold" for this temperature. The cracking threshold was found to be a function of the temperature, decreasing with increasing temperature. Although this relation is particularly difficult to treat exactly, since the samples were exposed under non-equilibrium conditions of stress, it is possible to explain this effect on the basis of changes in stress and ozone reactivity with temperature.

It is felt that studies of the effects of compounding on the cracking threshold may be of great value in designing compounds to fit the climatic conditions where they are to be used.

4:15 P.M.—20—Ozone and Sunlight Aging Studies of Carbon Black Vulcanizates. ***George E. Popp and Lynn Harbison (Phillips Chemical Co., Akron, Ohio).***

The economy resulting from marketing unwrapped rubber products, induced by material and manpower shortages during World War II, provided an incentive in postwar years to continuation of this practice by rubber manufacturers. As high finished product inventories accumulated, the rubber technician became confronted with a cracking condition created by ozone attack when a surface of the unwrapped product was exposed under stress. This situation plus the advent of the synthetic butadiene-styrene polymers and high structure furnace type blacks which were developed during the past decade precipitated several investigations to determine relative ozone resistance characteristics.

The theory was advanced by some rubber technicians that the high modulus furnace blacks were conducive to greater checking and ozone cracking characteristics when compared to conventional gas carbon blacks which exhibit lower modulus properties. Hence, this study was initiated about one year ago to determine the effects, if any, of individual types of carbon blacks

on checking and ozone cracking of natural and synthetic rubber under static testing conditions.

The work reported in this paper represents sunlight and ozone exposure (static) testing of natural crude and low temperature polymer with and without antioxidant in typical tire tread vulcanizates. A comparison of HAF, EPC, MAF, HMF, and SRF types of blacks is made. Specimens were exposed to sunlight aging in Akron, Ohio, during April and May of 1950 under 12½ percent stress and an additional series of specimens were simultaneously tested with a 180 degree bend. Germicidal lamps enclosed in a specially prepared cabinet were used for the ozone investigation, and a like series of specimens were exposed for comparison with the weather aging results.

The results show that carbon blacks, regardless of type, particle size, structure and physical properties imparted, do not affect the rate or degree of cracking in the polymers studied upon exposure to either sunlight or ozone when under static stress.

4:35 P.M.—21—Ozone Resistance of Neoprene Vulcanizates; Effect of Compounding Ingredients. ***D. C. Thompson, R. H. Baker, and R. W. Brownlow (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).***

The increased use of elastomers in applications involving exposure to ozone has resulted in greater interest in the factors influencing deterioration due to such exposure. Comparative tests have established the superiority of neoprene vulcanizates over those of other elastomers with respect to ozone resistance. Atmospheric ozone encountered during outdoor weathering has a negligible effect on neoprene vulcanizates. Resistance of neoprene vulcanizates to the high concentrations of ozone near electrical discharge systems is also outstanding.

The results reported in this paper show that properly compounded neoprene vulcanizates have excellent resistance to concentrations of ozone as high as 100 to 150 ppm. It is shown that the selection of compounding ingredients is a more important factor in developing resistance to ozone at high concentrations than it is at the low concentrations normally found in the atmosphere. The effects of amount and type of loading, softener, extender, or plasticizer, antioxidant, accelerator, and other compounding ingredients have been studied.

Factors influencing the results of ozone exposure tests are: (1) the conditioning of samples prior to testing, (2) the number and type of samples present in the ozone chamber, (3) the continuity of the test, (4) ozone concentration, (5) temperature of test, and (6) constancy of strain versus constancy of stress. Accelerated ozone testing should be considered as indicative rather than as an absolute measurement of resistance to attack.

Various carbon blacks and mineral fillers have been studied. Although no definite order has been established, it appears that those fillers which are known to have a large particle size impair resistance to attack by ozone. Increased loading with the fillers studied generally decreased ozone resistance although this observation is obscured by the effect of the increased loading on the stress-strain characteristics of the vulcanizate.

Some plasticizers and softeners improve and some impair the ozone resistance of neoprene vulcanizates. Certain vegetable oils, esters derived from vegetable oils, and softeners of the polymeric type improve the ozone resistance of neoprene vulcanizates. Conventional liquid plasticizers generally lower the ozone resistance of neoprene vulcanizates. Most ester plasticizers of the type used to provide flexibility at low temperature impart lower ozone resistance than the petroleum based type. Tributoxy ethyl phosphate is an example of a plasticizer which is particularly deleterious to ozone resistance. Differences in the effects of plasticizers become greater as ozone concentration is increased.

Antioxidants, which inhibit flex cracking, provide superior ozone resistance in neoprene vulcanizates. Di-para-methoxy-diphenylamine and diphenyl-para-phenylene diamine are outstanding examples. Many other antioxidants have been studied and found to provide varying degrees of protection. Increasing the amount of antioxidant results in increased ozone resistance. There are indications that certain of the non-discoloring types impair ozone resistance.

The effect of state of cure and type of accelerator used on the ozone resistance of Neoprene Type GN and Type W vulcanizates has been found to be of a relatively minor importance in comparison to the other variables studied.

Friday Morning—September 7

Symposium on Synthetic Rubber

I. Preparation of Synthetic Rubber

W. B. Reynolds, Presiding

9:00 A.M.—22—Introductory Remarks. J. H. Fielding and W. B. Reynolds.

9:05 A.M.—23—A Review of Important Polymerization Processes. ***R. L. Bebb (Firestone Tire & Rubber Co., Akron, Ohio).***

This paper comprises a general review of important polymerization processes useful for the preparation of synthetic rubber. Emphasis is placed upon emulsion polymerization systems such as (1) persulfate-mercaptan, (2) redox, (3) peroxamine, (4) MDX-ferricyanide, and others. The functions of various recipe ingredients such as emulsifiers, initiators and modifiers are discussed. Brief discussions of such mass polymerization systems as (1) sodium catalyzed, (2) Alfin, and (3) cationic catalyzed are included. The present and potential importance of various methods for synthetic rubber preparation are assayed.

9:35 A.M.—24—Viscosity-Conversion Relationships in Sulfur-Modified Polychloroprenes. ***W. E. Mochel (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).***

The solution properties, gel content and intrinsic viscosity of sulfur-modified polychloroprenes have been examined as functions of conversion to obtain information about the mechanism of sulfur modification and about the changes that occur during polymerization. Although soluble, plastic polychloroprenes, such as Neoprene GN and CG, have long been prepared by the polymerization of chloroprene containing small amounts of sulfur and treatment with tetraethylthiuram disulfide, little was known about the mechanism of this "modification."

It has been found that sulfur-modified polymers isolated at conversions beyond about 10% in polymerizations carried out at 40° C. or beyond 40% in polymerizations at 10° C. are largely insoluble before treatment with an alkaline emulsion of tetraethylthiuram disulfide. However, after treatment with the thiuram, the sulfur-modified polychloroprenes are soluble at conversions up to 90-95%. When the sulfur modifier is omitted, the polymers are insoluble even after treatment with the thiuram. These results, in confirmation of earlier results with radiosulfur, indicate that the sulfur modifier does not act as a chain transfer agent in chloroprene polymerization. The sulfur appears to introduce a linkage into the molecule which can be cleaved by a reaction involving tetraethyl thiuram disulfide to convert insoluble cross-linked polymer into soluble material.

The intrinsic viscosities in benzene of sulfur-modified, phenyl-alpha-naphthylamine-stabilized samples from polymerizations at 10° C. have been found to rise rapidly with increasing conversion to about 40% and then fall as gel separates. The gel point of a corresponding polymerization at 40° C. appears to be below 10% conversion. When the sulfur-modified polychloroprenes are treated with tetraethyl thiuram disulfide before coagulation, the intrinsic viscosities of the polymers made at 10° C. and 40° C. follow approximately the same course. The viscosity increases to a maximum at conversions of 18-20% and then decreases and remains relatively constant from approximately 30% to 80% conversion. At 85-90%, particularly for polymerization at 40° C., there appears to be a second but smaller maximum in the intrinsic viscosity-conversion curve.

The first peak in the viscosity curve is believed to be caused by a change in polymer structure resulting from increasing amounts of branching and/or cross-linking leading to a different axial ratio and, therefore, a different molecular weight-intrinsic viscosity relationship. Calculated partial conversion-intrinsic viscosities are in accord with this hypothesis. The possibility of changes in the amounts or types of sulfur linkages must also be considered. The second peak results from the formation of relatively tightly gelled network polymer that cannot be solubilized by treatment with tetraethyl thiuram disulfide.

9:55 A.M.—25—Polymerization Rates in Emulsion Systems. *Maurice Morton, P. P. Salatiello, and H. Landfield (University of Akron, Akron, Ohio).*

A study has been carried out on the emulsion polymerization of butadiene, isoprene and styrene, using several different catalyst systems, with a view to relating the rate of polymerization to particle size and number.

According to theory, the rate should be directly proportional to the number of particles and independent of all variables other than temperature. While this has been found to be true for styrene with the two catalyst systems tried, it is only partially true for the other two monomers. Both butadiene and isoprene show this "ideal" behavior when the catalyst system is of the hydroperoxide-polyamine type. However, with the other catalyst systems used, these monomers show a rate dependence on the amount of soap adsorbed on the particles.

Hence, it is found that the particle size and number in polybutadiene and polyisoprene latex is about the same, whether the polymerization is carried out at low temperatures with peroxide catalysts, or at higher temperatures with the Mutual Recipe. Within any given system, the particle size is decreased (and the number increased) by higher temperature, increased soap or increased catalyst charge.

II. Properties of Synthetic Rubber

J. D. D'Ianni, Presiding

10:15 A.M.—26—Introductory Remarks. J. H. Fielding and J. D. D'Ianni.

10:20 A.M.—27—Relationship Between Molecular Structure and Physical Properties of Synthetic Rubber. *S. D. Gehman (Goodyear Tire & Rubber Co., Akron 16, Ohio).*

This review paper seeks to bring together available information on relationships which exist between the most important features of molecular structure and the physical properties of synthetic rubbers. The molecular characteristics of greatest significance for the physical properties are considered to be the nature of the monomer units, molecular weight, cross-linking, details of chain structure such as cis-trans isomerism and side vinyl groups, chain branching, and crystallization.

In many experiments, observed variations in properties may be dominated by the detail of structure being investigated but other uncontrolled deviations in structure frequently occur, especially in the course of processing and vulcanization. Thus, quantitative correlations of structure and properties are usually possible only under ideal circumstances and very carefully controlled conditions. Nevertheless, a large amount of useful information is available for understanding the connections between the molecular structure and physical properties of the principal types of synthetic rubber. In general, each particular feature of structure exerts its most conspicuous influence on a rather limited group of physical properties. Emphasis is placed on the work which has been done to correlate molecular structure with the properties of vulcanizates compounded for service.

The chemical nature of the monomer units determines the intermolecular forces and influences especially the temperature range in which rubber elasticity is exhibited, the swelling in organic liquids, and the permeability to gases. Molecular weight distribution is most significant for processibility. Tensile strength and modulus are sensitive to low molecular weights but become insensitive to higher molecular weights. Cross-linking in the raw polymer gives rise to gel and affects the processibility. The cross-linked network formed upon vulcanization is controlling for the tensile properties and for stability under stress, especially in the absence of crystallization. Regularity in the geometrical form of the chain molecules appears to be favorable for low hysteresis and to be conducive to crystallization under stress. This leads to improved tensile strength and flex life. Effects of chain branching are rather obscure but serve to explain variations in properties not otherwise accounted for. These principles are illustrated in detail for various types of synthetic rubber and they serve to unify an otherwise bewildering diversity of properties.

10:50 A.M.—28—Some Effects of Polymerization Temperature and Molecular Weight. *J. R. Beatty (B. F. Goodrich Co., Brecksville, Ohio) and B. M. G. Zwicker (B. F. Goodrich Chemical Co., Cleveland, Ohio).*

The advantages of 5°C. "cold rubber" over "hot" GR-S in high black vulcanizates are well established. This paper describes some changes in micro and macro structure observed in butadiene-styrene copolymers made at five polymerization temperatures (—18°C., —10°C., 5°C., 20°C., and 50°C.) and their relation to changes in vulcanizate properties as a function of polymerization temperature and molecular weight.

The experimental rubbers were prepared so as to minimize variables other than polymerization temperature. Bound styrene was 23%, conversion 60%, and raw Mooney viscosity 48±7 ML. Polymers prepared at three reaction temperatures (50°C., 5°C., and —18°C.) were fractionated by precipitation into three molecular weight ranges in sufficient quantity for micro compounding studies.

Raw polymer characterization included molecular weight distribution by fractional precipitation, configuration of polymerized butadiene by infra-red, micro homogeneity by crystallization, and gellation tendency with hot air. Vulcanizates were evaluated in high and low hardness recipes for the usual rubber properties and also in detail for crystallization tendency, and dynamic properties. Commercial GR-S and "cold rubber" were included as controls.

It was concluded that the major differences in polymer structure of "cold rubber" as compared with GR-S are: (1) a narrower molecular weight distribution with less soupy polymer, (2) an increase in crystallization tendency, and (3) an increase in homogeneity of the polymer composition. Improvement in vulcanizate properties of stress-strain and resilience with reduction of polymerization temperature from 50°C. to 5°C. was proportionately much greater than that resulting from further reduction to —18°C., correlating well with crystallization tendency of the vulcanizate at —25°C., but not with the increase in homogeneity of the polymer composition.

Reduction in the amount of low molecular weight polymer softener in "cold rubber" as compared with GR-S increases its sensitivity to hot aging and changes the shape of its modulus cure curve. Actual processibility is much better than a "hot" GR-S made with the same tertiary mercaptan modifier. Evaluation of vulcanizates of fractionated polymers showed a marked decrease in hysteresis loss as molecular weight increased. There was a simultaneous increase in dynamic rate or modulus, but the product, as measured by temperature rise, decreased with increasing molecular weight in nearly all recipes.

11:10 A.M.—29—Viscosity-Molecular Weight Relation for Polybutadiene. II. Effect of Polymerization Conditions Which Influence Branching and Cross-Linking. *B. L. Johnson and R. D. Wolfangel (Firestone Tire & Rubber Co., Akron, Ohio).*

The changes in polymer structure which result from variation in polymerization temperature have been shown previously to influence the relation between intrinsic viscosity and molecular weight. The exponent of molecular weight, in particular, was found to increase as polymerization temperature was lowered. Similar increase in viscosity per unit molecular weight has been shown by previous authors to be indicative of a more linear, more extended polymer chain. Research of this nature was continued in order to determine if the change in the molecular weight exponent could be correlated with a particular change in polymer structure.

The exponent "a" in the relationship $[\eta] = KM^a$ was found to decrease as the hydrocarbon conversion of emulsion polybutadiene was increased from 20.5 to 81 per cent at a constant polymerization temperature of 50°C. Values of 0.45, somewhat below the theoretical lower limit of 0.50, were obtained for the molecular weight exponent at conversions which would normally be considered to be at or beyond the gel point as judged by intrinsic viscosity-conversion curves.

The molecular weight exponent of a series of polybutadienes made with progressively less modifier was also found to decrease as the modifier concentration decreased. Infra red analyses of polymers from these two series indicated no trend in microstructural changes such as the amount of 1,2 addition or in the

cis-trans ratio of the 1,4 adduct with increase in conversion or in modifier level.

On the basis of these results, it was felt that branching and cross-linking were the predominant changes in polymer chain structure as conversion progressed or modifier was reduced. More direct evidence was obtained to substantiate the effect of cross-linking upon the molecular weight exponent by copolymerization of increasing amounts of divinyl benzene with styrene in the GR-S system at 50°C. As the number of divinyl benzene units or potential cross-linking sites per polymer molecule was increased there was a rapid decrease in the molecular weight exponent from the value of 0.92 obtained for the non-cross-linked polystyrene. This decrease in exponent levels off to a relatively constant value of between 0.5 to 0.4 when the number of divinyl benzene units per molecule exceeds four.

While this method does not provide an absolute means for measurement of cross-linking or branching because the value of the molecular weight exponent for a completely unbranched polymer has not been established, it does make possible the evaluation of cross-linking relative to the gel point. It also indicates that few cross-links are required to reduce the molecular weight exponent of a relatively linear polymer to the lower theoretical limit of 0.5 found at the gel point of polybutadiene. Evidently soluble polybutadiene produced to normal conversion in the GR-S system at or above 50°C. is very close to the gel point.

11:30 A.M.—30—Structure of Alkali Metal-Catalyzed Butadiene Polymers. *A. W. Meyer, R. R. Hampton, and J. A. Davison (U. S. Rubber Co., Passaic, N. J.).*

Structure determinations by the use of infrared absorption measurements were made on various butadiene polymers and copolymers. The procedure previously reported for emulsion polymers by E. J. Hart, A. W. Meyer and R. R. Hampton was used for this work.

The polymers which were made at the Government Laboratories in Akron included polybutadiene and butadiene-styrene copolymers. They were catalyzed by sodium, potassium and equimolar mixtures of sodium and potassium. Polymerization temperatures were varied over the range 5°C. to 75°C. Pentane, methylcyclohexane, toluene and xylene were used as diluents. "Modifiers" employed to reduce the polymerization rate were dodecylamine, piperidine, Flexol 4G0, isopropyl ether and dianisyl disulfide. All of the alkali metal-catalyzed polybutadienes had a higher proportion of the butadiene in the 1,2 configuration (45-80%) than the values obtained for emulsion polybutadiene (18-23%). Polybutadienes catalyzed by potassium had 15-20% less butadiene in the 1,2 configuration than those in which sodium was the catalyst. When a mixture of sodium and potassium was used, the results were nearly the same as with the potassium catalyst alone. The butadiene in *cis* 1,4 and *trans* 1,4 configurations increased proportionately as the % 1,2 decreased. Sodium catalyzed polybutadienes made at 5°C. had about 15% more butadiene in the 1,2 configuration than those made at 45°C. Potassium catalyzed polybutadiene made at 5°C. had 10% more butadiene in the 1,2 configuration than those made at 45°C.

The diluents and "modifiers" influenced polymerization rates and molecular weights but had little or no effects on the structure of the polybutadienes. The butadiene-styrene copolymers were found to have the butadiene portion with about the same relative proportions of 1,2, *cis* 1,4 and *trans* 1,4 as the butadiene homo-polymers.

The second order transition temperature of sodium catalyzed polybutadiene made at 30°C. was —45°C. whereas the 75°C. polybutadiene had a value of —64°C.

11:50 A.M.—31—Polysulfide Polymers: Low Temperature Properties. *E. M. Fettes, J. S. Jorczak, R. L. Knarr, and P. E. Meiss (Thiokol Corp., Trenton, N. J.).*

A systematic survey was made of the effect of structure upon the low temperature properties of polysulfide polymers with the objective of obtaining a polymer superior to that derived from dichloroethyl formal.

A total of ninety dihalides were obtained or synthesized for this study. The polymerization of these intermediates was carried out in a standard manner to produce high molecular weight polymers. In many cases, reaction conditions had to be varied to produce polymers of sufficient chain length to be capable of evaluation as rubbers.

The main structural variables investigated were length of chain between disulfide groups, types of atoms in chain, and types of side chains. Hydrocarbon chains from methylene through hexamethylene were investigated as well as chains composed of ethylene oxide residues. The replacement of carbon atoms in the chain by oxygen, nitrogen, and sulfur was examined. The effect of various length side chains was investigated by studying the properties of polymers containing alkyl and aryl side groups attached to chain carbon atoms. Also various ethers and esters of 2,3-dichloropropanol were converted into polysulfide polymers to examine the effect of groups linked to the chain through oxygen atoms.

The effect of various amounts of tri and tetrafunctional cross-linking agents was examined. The effect of varying amount (rank) of sulfur combined in the polymer was also studied.

The high molecular weight polymers were converted to crude rubbers with terminal thiol groups by standard techniques. The rubbers were compounded and cured in a standard formulation. The effect of curing agent, and type and amount of loading, on low temperature properties was also determined.

The vulcanizates were subjected to physical testing. The main dependence for evaluation of low temperature properties was on a torsional modulus test, but low temperature compression set was also measured. Volume swell in SR-6 and in water was determined on all polymers tested.

Although no one monomer gave a rubber superior to that from dichloroethyl formal, a number of copolymers of that dihalide were found to be significantly better in low temperature flexibility.

Friday Afternoon—September 7

Symposium on Latex — Natural and Synthetic

L. A. Wohler, Presiding

2:00 P.M.—32—Introductory Remarks. J. H. Fielding and L. A. Wohler.

2:05 P.M.—33—Review of Recent Progress in Latex Technology. *E. A. Murphy (Dunlop Tire & Rubber Co., Birmingham, England).*

The paper is concerned mainly with recent progress in the technology of natural latex with briefer reference to synthetic latices. Advances in the production of latex concentrates are outlined and progress reported in the partial replacement of ammonia as a stabilizer. Reference is made to the electro decantation process and the nature of the concentrate produced.

Recent work on the constitution of natural latex is discussed; also progress made in modifying stability and other properties of latex concentrates to render them suitable for special applications.

The established methods of evaluating the chemical and physical properties of latex are outlined and the relative abilities of these tests to indicate the behavior of the latex in various processes discussed. Newer methods of testing and their applications are also described.

Some of the more important advances in the manufacture of latex products are touched upon and comments are made on the future trends of research and development in the latex industry.

2:40 P.M.—34—Latices of Flexible Synthetic Polymers. *B. M. G. Zwicker (B. F. Goodrich Chemical Co., Cleveland, Ohio).*

During the past ten years there has been rapid progress in manufacture and use of flexible synthetic polymers. The merits of water-based systems have been well recognized, and there are now nearly two hundred synthetic rubber, plastic or plasticizable polymer latices commercially available in the United States. These uncompounded products of over thirty manufacturers have been grouped into fifteen classes according to reported polymer composition (five types of rubbers and ten types of plastics).

General properties of synthetic latices are discussed. These include: (1) the effect of particle size on stability and viscosity; (2) characteristics of typical emulsifiers, dispersing and thickening agents and their influence on stability, coagulatability and

application, and (3) wet and dry film strength properties of typical synthetic polymers.

Each class of polymer is discussed with reference to inherent polymer properties and how these are related to principal applications. Good heat, light and air aging, as well as chemical, oil, grease and solvent resistance, are characteristics of over half the commercial materials. Most synthetic polymers possess substantially higher modulus and less tack than Hevea latex. Water resistance, adhesive and cohesive properties, flexibility, and thermoplasticity can be selected over wide ranges. Many polymers contain polar or chemically reactive groups that impart affinity for cellulose, metals or other structural materials. These and other specific properties have resulted in many improved or new products in the fields of adhesives (structural, temporary, laminating, fiber and pigment), surface coatings, supported film, unsupported film, foamed sponge and coagulant dipped or molded articles. Certain deficiencies in existing materials are pointed out.

New products entering the market include water dispersable polymers (for hydrosols), water soluble polymers (poly electrolytes and hydrophillic compounds), and plastisols (resins dispersed in plasticizers). These are not discussed in detail but specific advantages over latex systems are mentioned. Water dispersable thermosetting resins have not been considered except as compounding ingredients.

3:00 P.M.—35—Some Factors in the Prevulcanization of Latex. *H. B. Townsend, P. G. Cook, and P. A. Coffin (General Latex & Chemical Corp., Cambridge, Mass.).*

Dr. Phillip Schidrowitz, of London, discovered in the mid '20's that latex can be prevulcanized without coagulation. In the elapsed years this idea has proven of major utility to the latex industry. Currently the bulk of all latex used is believed to involve, in a modern form, the prevulcanization techniques first taught by Dr. Schidrowitz. Four interrelated steps are of major importance in commercial usage of latex prevulcanization techniques: (1) Stabilization of the latex involved; (2) Selection of vulcanizing ingredients; (3) Dispersion of the compounding selection; (4) The methods of forming sulfur or equivalent linkages.

This paper outlines some of the methods of selecting or modifying a latex that is to be prevulcanized. Some such test methods relate to colloidal adsorption properties as reflected in changes in stirability, or solvent drop tests. Other tests relate to specific reactivity toward vulcanizing ingredients with special detail given to studies of the reactivity of a latex toward zinc oxide. From the results of such control tests it has been found commercially feasible, if desired, to subject compounded latex to temperatures even above the boiling point of water and also to moderate agitation simultaneously. Methods of following the changes developed from sulfur linkage, such as chloroform coagulation, toluol swelling tests, and T-50 methods, are discussed.

A study has been made of the aspects of vulcanization in the "maturing" step involved in the manufacture of latex foam. This step is shown by data to conform to a prevulcanization initiation and its course is followed by measurement of swelling coefficients as functions of time and compounding ingredient selection.

3:20 P.M.—36—Physical Properties of Films from Mixtures of Natural and Synthetic Rubber Latex Blends. *R. M. Pierson, R. J. Coleman, T. H. Rogers, Jr., D. W. Peabody, and J. D. D'Ianni (Goodyear Tire & Rubber Co., Akron, Ohio).*

Synthetic butadiene-styrene copolymer latices were prepared for evaluation of their film vulcanizate properties, both alone and in blends with natural rubber. The effects of the following polymerization variables were studied: (a) polymerization temperature; (b) degree of conversion, over range 25-95%; (c) latex particle size as polymerized; (d) butadiene/styrene ratio, in range 100/0 to 50/50; (e) plasticity, in range of Mooney (small rotor) 25 to 100.

Most of the present study of polymer variables has been made on compounded natural-synthetic blends cast as unloaded latex films and vulcanized in an air oven. Some comparisons were made with similar compositions which were mill-mixed and press-cured, or were latex cast and press-cured without mixing. Stress-strain characteristics and low temperature behavior have been the principal properties determined on the films.

For a given polymerization temperature and charge ratio, the conversion of the synthetic latex appears to be most important in determining its value as an extender for natural latex. For example, a 60% conversion Type V GR-S latex has considerably better stress-strain properties in 50/50 to 10/90 synthetic/natural ratios than does Type V polymerized to the usual conversion (95%). Above 60% natural rubber the properties of the blends approach each other so closely that the differences are indistinguishable.

The synthetic latices prepared at low temperature (41°F.) gave blends with stress-strain properties superior to those of comparable high temperature (122°F.) polymers. Also, the low temperature flex properties of the blends were superior for the latices reacted at low temperature.

Increasing the styrene content had favorable effects on stress-strain properties and deleterious effects on low temperature properties, in accord with observations of other workers. Increasing the Mooney viscosity improved stress-strain properties when such increases resulted from an increase in the average molecular weight of essentially soluble or loosely cross-linked polymer, but not when the increase was due to the presence of tight gel.

Latices of small particle size which were agglomerated to a large particle size prior to blending gave properties essentially the same as those of latices whose large size was attained in the reactor.

3:40 P.M.—37—Water Vapor Permeability and Sorption of Hevea Latex Films. *William W. Bowler (Firestone Tire & Rubber Co., Akron, Ohio).*

It is a well known fact that a considerable structural difference exists between Hevea latex films which are vulcanized after drying and similar films when vulcanized in the latex state. Since these two types of films differ considerably in water vapor permeability and sorption, a careful study has been made of these phenomena with the hope of throwing some light on the question of film structure.

Using the cup method, an investigation was first made of the variables in the permeability equation,

$$Q = \frac{P \cdot A \cdot t \cdot \Delta p}{x},$$

where Q is the weight of water vapor passing through the area, A, of a film of thickness x in time, t, Δp is the vapor pressure difference, and P is the constant of proportionality called the permeability constant. It was found that, following the above equation, the weight of water permeating through an uncompounded film is inversely proportional to the thickness of the film over a wide range of thicknesses and directly proportional to the vapor pressure difference except at very high values of Δp. This was not true for films vulcanized in the latex state.

An investigation of the relation

$$C = S\,p$$

where C is the weight of water sorbed per unit weight of rubber, p is the aqueous vapor pressure, and S is the sorption coefficient, revealed that this sorption equation is followed only by films vulcanized in the latex state at low values of p. Films cast from vulcanized latex were found to be much more permeable to water vapor, to sorb considerably less water, and to have a greater negative temperature dependence of permeability than uncompounded or dry vulcanized films. The effect of various compounding agents and of film stretching upon permeability was determined.

It is concluded from these experiments that diffusion of water vapor takes place primarily through void spaces in wet-vulcanized films, and through rubber polymer or through the adsorption layer by continual adsorption on and desorption from active centers present in the hydrophyllic surface material in uncompounded and dry vulcanized films. Both processes, diffusion through rubber polymer and through the adsorption layer, can be considered as an activated diffusion. The question of whether the strength of wet-vulcanized films depends upon secondary van der Waals forces or upon primary sulfur linkages between the particles is briefly discussed.

4:00 P.M.—38—Mechanical and Chemical (Zinc Oxide) Stability Tests. *C. O. Miserentino (Dunlop Tire & Rubber Co., Buffalo, N. Y.).*

There is some question as to whether the present generally accepted methods for determining the mechanical and chemical (zinc oxide) stability of latex give a completely accurate index of the stability under conditions that prevail in ordinary handling operations. This test requirement is met by a method based on the volume/time froth curve produced on whipping a known amount of latex of normal operating concentration and controlled temperature at a constant speed.

Experimental results reported in this paper show: (1) A method for measuring the mechanical and chemical (zinc oxide) behavior or stability of latex, the results of which have a direct bearing on possible practical applications of the latex being tested; (2) That the volume/time froth curve permits a qualitative or quantitative characterization of each portion of that curve, which may in turn be expressed as low, moderate and/or high rate of rise, stability end point and rate of froth drop; (3) That destabilization or change in slope of the volume/time curve takes place before the occurrence of visual agglomerated rubber particles, thus defining the stability end point as that point at which a change in slope of curve occurs; (4) That the so-called mechanical or chemical stability end point is not a complete criterion in itself. It may be considered only as a contributing characteristic factor in conjunction with the rate of rise (stabilization-volume/time curve) and the rate of drop (destabilization-volume/time curve).

4:20 P.M.—39—Studies on the Yellow Fraction of Latex. *G. E. van Gils (Indonesian Rubber Research Institute, Bogor, Indonesia).*

Further studies on the yellow fraction of fresh Hevea latex (Homans, L. N. S. and van Gils, G. E., "Fresh Heavea Latex: A Complex Colloidal System," in "Proceedings of the Second Rubber Technology Conference," pp. 292 - 302) show that the so-called lutoids are redispersed after ammoniating fresh latex and that the dissolution, previously assumed, occurs only partially. In addition to the rubber phase it is concluded, therefore, that there is another phase which also contributes to the viscosity of ammoniated latex. The lutoids also dissolve partially by addition of monovalent salts and from this work it is suggested that a portion of the yellow fraction consists of a complex coazervate (liquid precipitated from an emulsion). Experiments in connection with this partial separation of the yellow fraction of latex are described and their technological importance, for example in the manufacture of latex crepe, are discussed.

4:40 P.M.—40—GR-S Latices in Foamed Latex Rubber. *Leon Talalay (Sponge Rubber Products Co., Shelton, Conn.).*

The advent of low temperature polymerization with the resultant improvement in the pure gum strength of GR-S latices had made possible the production of serviceable all GR-S foamed latex rubber.

A study was undertaken to evaluate the physical properties of GR-S foamed rubber made from LTP latices of varying polymerization recipes. The effects of butadiene/styrene ratio, Mooney viscosity, conversion and temperature of polymerization were investigated. The physical properties evaluated included foamed rubber tensile and elongation, modulus of compression, flexibility at sub-zero temperatures, rebound elasticity, and flex life. Slab foamed rubber samples of all polymers were prepared using the method of U. S. Patent 2,432,353. Hevea foamed rubber was taken as a standard of comparison.

Both tensile and elongation of foamed rubber made from 41°-50° F. GR-S were found to be five times that of foamed rubber made from GR-S polymerized at 122° F. Tensile of LTP GR-S foamed rubber (at 26% bound styrene) is better than 50% of the tensile of Hevea foamed rubber, which is contrary to results indicated by film data. Of several film techniques investigated a "rolled ring" method gave best results. In better agreement with film data, the elongation at break of LTP GR-S is at least two thirds that of Hevea.

Lower temperature of polymerization of GR-S also results in foamed rubber with improved rebound elasticity to the point of closely approaching that obtained with Hevea. Rebound was measured in vacuum in order to minimize pneumatic effects.

Reducing bound styrene in polyamine-activated 41° F. GR-S latex from 26% to 0%, by steps, results in a linear decrease in foamed rubber tensile, aggregating to 30%, while no effect upon elongation and rebound at room temperature was observed.

Styrene content has a profound effect upon the flexibility of GR-S foamed rubber at —40° F. and even more so at —70° F. A very pronounced optimum exists at approximately 11% bound styrene.

A clear cut relationship appears to exist between the compression modulus of foamed rubber and the Mooney viscosity of the polymer. For example, the resistance to compression doubles when increasing the Mooney viscosity (ML-4) from 36 to 150. Polymerization conversion between 50% and 80% has little effect upon the properties of the resultant GR-S foamed rubber.

In both LTP GR-S and Hevea foamed rubber increased sulfur ratios result in improved modulus, low temperature flexibility and rebound, while the elongation decreases. A notable difference is that the tensile of Hevea foamed rubber deteriorates while the tensile of LTP GR-S foamed rubber improves slighly with increasing sulfur content.

The colloid chemical system of the polymer latex enters directly into the problems of foamed rubber manufacture. Some of the limitations imposed by this fact upon polymerization recipes are discussed.

Reports of Avoidable Accidents

Unusual Hand Truck Accident: A worker, assisted by four other employees, was moving a 4 foot by 8 foot tire truck loaded with 7550 pounds of sheet iron into a storage area. The rear wheels of this truck are 2 feet from the end of the truck bed; the sheet iron was in 10-foot lengths extending 2 feet beyond the end of the truck bed, placing the center of the load one foot in front of the rear wheels. Three of the men were pushing at the end of the truck, with one man on each side. There was a small pile of sheet iron on the floor approximately ¾ inch high, over which they endeavored to force their load by giving it a good start in order to get to a vacant space beyond.

The rear wheels of the truck, which were the first to strike the obstruction, did not go over. The momentum caused the banding on the sheet iron to break and all but the bottom sheet to slide forward so that the center of balance was past the rear wheels. The end of the truck on which the men were pushing was elevated to the height of a man's face, and the force of the iron sliding off shot the truck and one man into a partition some 10 feet behind. The truck and the remaining sheet of iron struck the worker in the face and chest. His nose and tongue were severely lacerated, and two ribs were fractured.

To prevent recurrence, the department shall strictly enforce the rule which forbids men to attempt to push loads over obstructions. They also will purchase and use load binders in order to keep heavy loads from shifting. The fourteen trucks used by this department will have the rear wheels moved closer to the end of the truck.

Machine Accident: An employee claims that, while he was putting on tread, the free end of the tread hit the foot pedal, starting the machine. His left arm became caught under the tread, and he went forward over the drum. His forehead struck the tread guide and was gashed. The sidewall guide struck him in the left shoulder joint. He received a severe contusion of the left shoulder area and left arm. He was taken to the hospital on a stretcher, admitted to a ward until X-rays were taken, and released the following day. A guard has since been placed over the foot pedal.

Editorials . . . . . .

More Synthetic?

DESPITE conflicting statements from officials on the Washington scene, it seems evident that the United States is nearing its stockpile goal for natural rubber—whatever that goal may be. In many quarters the figure of 1,000,000 long tons is heard, but in others it is put closer to 1,500,000 tons. Accordingly, much credence is placed in the persistent rumor that the bars will be let down shortly on the consumption of natural rubber.

In view of this situation the recent suggestion by Paul W. Litchfield, chief executive of the Goodyear Tire & Rubber Co., that the United States should increase its synthetic rubber capacity by 50 percent may sound a little startling. The suggestion sounds even more startling when weighed with the recent prediction of the International Rubber Study Group that a possible surplus of 400,000 long tons of natural and synthetic rubber is in the offing for the current year. Increasing our synthetic rubber capacity by 50 percent would bring it up to approximately 1,350,000 tons, or more new rubber than the United States has ever used within one year.

The Goodyear executive, however, is not given to idle statements, and he advances the four following reasons for his suggestion: (1) World use of rubber continues to increase, having increased by 100 percent in the last decade; (2) The United States should be able to supply not only itself but its allies in case of war; (3) The price of natural rubber is too high, and (4) Because of unsettled conditions in the Far East, practically no new rubber trees have been planted in the past 10 years, which will have a definite effect on the amount of natural rubber which will be available in the future.

There can be no argument with Mr. Litchfield's comment on increasing world consumption of rubber. The statistics prove that there has been a decided pattern in consumption in ten-year cycles. World consumption in ten-year periods since the turn of the century has been as follows: 1900-09, 662,500 long tons; 1910-19, 1,684,000 tons; 1920-29, 5,069,000 tons; 1930-39, 8,960,000 tons; 1940-49, 13,495,000 tons. The 1940-49 period, of course, includes synthetic rubber consumed. Consumption for the 1950-59 period, based on 1950 consumption, is proceeding at the rate of over 22,000,000 long tons.

It is true that world consumption of rubber has jumped considerably in the past 10 years over any previous ten-year cycle, due primarily to World War II, but it is equally true that the point has been reached where world consumption of 2,500,000 tons of rubber, natural and synthetic, can no longer be considered "abnormal." In the same sense, annual consumption of 1,200,000 tons of rubber in the United States must now be considered as "normal." Mr. Litchfield's statement with regard to an increase of 100 percent in the past 10 years is based on world consumption of 1,152,000 long tons in 1940 as against 2,285,000 tons in 1950.

In view of these statistics, official Washington should give some serious thought to increasing current synthetic production facilities. It is doubtful whether an increase of 50 percent in current facilities is called for by the statistics alone, but the statistics plus continued disturbing world conditions certainly warrant some increase in these facilities.

Indonesian Rubber

THROUGH the overdue cooperation of the British Government, the flow of natural rubber to Russia and its satellites has now been reduced to a dribble, at least as far as British Malaya is concerned. Whether the communist stockpile will begin to dwindle or whether it will be expanded further now lies in the hands of the Republic of Indonesia. Thus far Indonesia seems inclined to sell its rubber to the highest bidder, particularly if the nation making the bid is in a position to supply the new republic with the dozens of vital materials it needs for its growth. The action of the British, therefore, obviously places a new problem in the laps of American diplomats where Indonesia is concerned. The next few months should tell an interesting story.

CURRENT NEWS OF THE MONTH

THIRD QUARTER USE SET AT MAY LEVEL AS GSA CONSIDERS NATURAL PRICE CUT

THE National Production Authority told the Rubber Industry Advisory Committee, meeting in Washington, D. C., on May 28, that the May rubber order will be continued through the third quarter of 1951. Meanwhile, Jess Larson, General Services Administrator, stated that the government intends to lower the price at which it sells natural rubber to industry. In announcing plans for third-quarter allocation, NPA said that the United States has not yet reached the natural rubber stockpile goal it considers essential for national security and until it does there can be no increase in the allocation of rubber for civilian use. "The stockpile situation is still critical and we're putting every pound we can get into it," Leland L. Spencer, director of the NPA Rubber Division, told the industry representatives.

The May order, which increased civilian use by 8,000 long tons over April consumption, permits production of many essential rubber products at 100% of their base period rate (1950 fiscal year) while restricting others to the April rate of 90% of base period use. The estimated consumption of all rubber for civilian use in the third quarter is 204,200 long tons, 29,200 tons more than the first quarter and 11,000 tons more than the estimated second quarter total. Complete figures are presented in the accompanying table.

Some members of the Rubber Industry Advisory Committee asked that more consumption be permitted immediately, particularly in production of larger size truck tires. NPA pointed out that rubber saved by the ban on spare tires as original equipment for new passenger vehicles was channeled by the April order into the manufacture of truck, bus and agricultural equipment tires. Industry spokesmen, however, said a shortage of heavier tires still exists.

Studying Special Report

The committee was told that a special report by industry technicians on the rubber specifications necessary to meet projected military needs is being studied by the government to determine rubber stockpile requirements. In addition, NPA said it is now sending out forms to the industry to determine production capacities.

Regarding the Controlled Materials Plan which goes into effect in the third quarter, NPA pointed out that the plan covers steel, copper and aluminum. Under CMP, the rubber industry will be allocated the amount of these scarce metals it needs to meet the essential rubber program, NPA said.

Rubber Industry Advisory Committee members were also told that present practices of maintaining an inventory of about 25,000 tons of synthetic rubber would be continued to make possible an equitable distribution system. An industry spokesman proposed that this inventory be reduced, but NPA explained that before the system was put into effect some smaller manufacturers weren't getting their monthly allotments until too late in the month to use them.

NPA also said that the present policy of permitting the importation of rubber products without limitation on their natural rubber content would be continued until it is determined that domestic manufacturers are being hurt by the practice.

Planning Natural Price Cut

The General Services Administration, now the sole U. S. importer of natural rubber, promised to reduce the price of natural rubber resold to manufacturers as soon as it has rubber available which has been purchased at lower prices. Early in May rubber prices in the Far East tumbled from 57c a pound to 48c a pound, according to one GSA official.

Rubber manufacturers have been paying the government 66c a pound for rubber for some time. This price was fixed by GSA as representing the average cost paid for rubber by the government plus administrative costs and shipping. Since December, GSA has been paying as high as 78c a pound and as low as 57c until the price break in May.

Government rubber officials did not say how much the price cut would be or exactly when it could be expected. They did say the entire amount in the reduction in the cost to the government would be passed on to rubber consumers. The cut might amount to the difference between the 48c paid early in May and the 57c paid prior to that time by the government. This would reduce the government selling price to approximately 57c a pound.

GSA also intimated the time might soon come when the government will turn rubber buying back to private industry. Mr. Larson stated that the exclusive buying program will not be continued one day longer than is absolutely necessary to safeguard this country's rubber supply and to insure distribution and use of the available supply in a manner most advantageous to national defense.

Rubber Order M-2 Amended

In an amendment to NPA Order M-2, dated May 21, 1951, NPA pointed out that the present 30-day inventory limit on tires is applicable at each stage of distribution. The government agency also explained that original equipment tires are not included in the 90% limitation on consumption of rubber in the production of motorcycle and bicycle replacement tires and tubes.

Regarding the inventory limit, the amendment states: "Each place of business engaged in the distribution of tires and tubes shall be deemed a separate person for the purpose of this section, regardless of its ownership or control, and delivery to it shall be subject to this section regardless of whether such delivery is made on consignment, as an intra-company delivery, or otherwise."

NPA said this amplification of the original order was designed to make clear that even if a company retains ownership of a tire through the channels of distribution, it is permitted to apply the inventory at each point. It may not, however, exceed the limit at any given point.

A language change in the Appendix B list of products, which are limited to 90% of their adjusted base period rate of consumption, simply repeats the word "replacement" before each listing of a type of tire or tube. In the original May order the word "replacement" was used only at the beginning of the tire list, and NPA said some questions had arisen as to whether the qualifications applied to all tire and tube categories.

The only other language change in the Appendix B list specifically exempts fiber floor covering from the list of floor and wall coverings which are limited to 90% of base period consumption. There was no intent to include fiber coverings, NPA said, and the amendment specifically excludes it. The amendment also names the NPA forms which rubber consumers shall complete and return to NPA. These include a monthly report on consumption and stocks; a report by tire, tube and camelback manufacturers on production, shipments and inventory; a report by tire manufacturers on weekly production of cured tires; a report by latex importers on the amounts of latex imported each month, and general procedures covering receipts, deliveries, etc.

The original May action increased the permitted use of rubber in many products,

including those for essential civilian uses, to 100% of the base year rate. As an example of the result of the emphasis on the more important uses, NPA pointed out that the May total in truck and bus tire production will approach closely the record production level of the first quarter of 1947 and will be far above the levels of 1948, 1949 and 1950.

Over-all production of essential civilian rubber products has reached an all-time high even while the industry has maintained the defense and defense-supporting programs, NPA said. There should be few, if any, real shortages in consumers' rubber goods unless there is an all-out war. Even should that happen, NPA said, the rubber industry would be in a much better position to meet the demands than at any time in its history.

Small Business Subcommittee

Meanwhile, the Senate Small Business Subcommittee met with defense agency leaders and small company representatives on June 6 in Washington, D. C., to review industry recommendations for systematic removal of government controls on rubber. The meeting was called by Senator Guy M. Gillette (Dem., Iowa), chairman of the subcommittee which held extensive hearings into rubber allocations in April.

Invited to the meeting were Mr. Larson, Manly Fleischmann, NPA Administrator, Mr. Spencer, John D. Small, chairman of the Munitions Board, and W. Stuart Symington, newly-appointed Administrator of the Reconstruction Finance Corp. Four members of the 21-man industry "watchdog" committee, named by Senator Gillette to advise his subcommittee on the impact of rubber controls on small companies, presented a series of 11 recommendations drawn up in May.

The principal recommendation was that NPA channel at least 120,000 tons a month of new rubber into civilian and military goods and systematically remove small and medium size companies from usage restrictions. The "watchdog" group asked for the subcommittee's support for stripping controls by September 1 from all but the 20 largest companies who account for about 75% of rubber consumption. The 11 recommendations advanced by the "watchdog" committee are:

1. NPA should make available at least 120,000 tons of total new rubber for the industry for the next three to four months. This compares with a May allocation of some 113,000 tons, including 97,000 for civilian goods and the industry's previous record use of 119,000 tons last October.

2. Removal of new rubber consumption ceilings "on a systematic basis" after Sept. 1, when rubber available to industry should be in ample supply.

3. Continue expanding production of synthetics, stockpiling any excess.

4. Continue to require high percentage use of synthetics in rubber products.

5. Allocate synthetic rubber on a quarterly rather than a monthly basis.

6. Increase synthetic rubber allocations to smaller companies and lower Government selling prices for imported natural rubber to match world market prices. Small companies are allocated too little synthetic, and too much higher priced natural rubber, the group said.

7. To announce rubber allotments well in advance.

8. In June, start removing restrictions on the total rubber usage by some 860 companies that consume less than a million pounds monthly, with all restrictions on them to be lifted by Sept. 1. This would leave 20 companies normally accounting for 75 percent of industry's rubber consumption, under control, the group said.

9. Ban imports containing more natural rubber than domestic manufacturers are permitted to use.

10. Eliminate the "unworkable" limitations on tire inventories of manufacturers and distributors.

11. Eliminate NPA's essentiality standards by the May 1 revision of the NPA Rubber Order, M-2, restricting production of replacement passenger car tires and other non-essential items to 90 per cent of last year's rate.

Further Exemptions Considered

On June 7, Donald F. Pratt (Durkee-Atwood), chairman of the "watchdog" group, announced that Mr. Spencer had promised to increase the present exemptions on smaller rubber firms, but was noncommittal on the industry's proposal to "lift" the exemption by September 1 from all but the 20 largest companies. Mr. Spencer did not say when, how, or how much the exemption would be increased, Mr. Pratt added. Under the rubber order now in effect, companies using less than 25,000 pounds a quarter are free from restrictions.

Mr. Pratt also reported that Mr. Spencer had turned down the proposal that 120,000 tons or more of rubber be made available monthly for military and civilian use. Subcommittee counsel Charles Shaver said that Mr. Spencer had promised to seriously look into the industry's demand that the recently lifted ban on certain rubber imports be reinstituted to protect domestic manufacturers.

Mr. Pratt said that he had been informed that foreign-made white sidewall tires are en route to the United States. Since mid-March, manufacture of white sidewall tires has been banned in the United States. The subcommittee and its industry "watchdog" group will meet again in a few weeks with government rubber officials, Mr. Shaver said.

The Scrap Rubber Dealers Industry Advisory Committee informed the National Production Authority on June 1, that scrap rubber supplies are plentiful, and that reclaimers can successfully meet the government's scrap rubber requirements this year. NPA told the committee that total consumption of scrap rubber by reclaimers for the first quarter of 1951 was at an annual rate 25% greater than for the whole year of 1950. Officials believe that this rate represents a reasonably accurate forecast for the entire year of 1951 because the production of reclaim this year is estimated to be about 25% greater than for 1950.

Committee members, while pleased with the general scrap supply situation, objected however to the practice of some firms which are straying from the recommended policy of acquiring their needs on a strictly month-to-month basis. Discussing the requirements for scrap rubber, broken down into types, the committee reported as follows:

Tires, all types: Industry will come fairly close to meeting tire needs.

Tubes, black, red and butyl: NPA's estimates on tubes seemed conservative to the committee, which said that black and butyl tube requirements could be met, but there is some doubt about red tubes.

Peels, No. 1, 2 and 3: This year's requirements for peels are too high, members said. The industry reported it could come close to satisfying 1951 peel requirements "if the price was right." NPA pointed out there is a particularly strong demand for No. 2 peels.

NPA said that natural rubber scrap is going to become less available because butyl is rapidly replacing natural rubber in tubes.

Synthetic Rubber Developments

Synthetic rubber production can now be substantially increased from the same amount of raw material due to a new chemical development announced by the Dow Chemical Co., Midland, Mich. Increases will be possible, the company said, through the use of a Dow-developed catalyst which will make the manufacture of butadiene more efficient. The value of the new catalyst lies in the fact that it will produce more butadiene and less gases having only fuel value, from a given amount of butylene.

Phillips Petroleum Co. has announced that one of the serious "bottlenecks" limiting synthetic rubber production has been

CIVILIAN CONSUMPTION OF ALL TYPES OF RUBBER IN THE FIRST THREE QUARTERS OF 1951
(Long Tons)

	First Quarter (actual)	Second Quarter (estimated)	Third-Quarter (estimated)
GR-S	127,000	133,000	149,300
Butyl	15,900	14,500	16,800
Other Synthetic	15,200	16,000	15,500
Total Synthetic	158,800	163,500	181,600
Dry Natural	90,600	103,600	96,500
Total New RHC (Dry)	249,400	267,100	278,100
Natural Latex	15,600	16,100	16,100
Total	265,000	283,200	294,200

eliminated through the use of a new Phillips development. For some time it has been known how to produce synthetic rubber in only a few hours rather than the usual 12 to 14 hours. Advantage could not be taken of these super-fast reactions because plant equipment could not remove the great amount of heat generated.

Phillips recently developed a means of inserting cooling coils in the present reactors to remove the heat faster. On plant scale runs, rubber is now made in eight hours, the company reported. Full use of the new development should help relieve existing rubber shortages, the company believes.

The government began an allocation plan for sulfur in 11 West Coast states on June 1. However, the plan may be extended to the East if conditions require. The allocation of sulfur is considered necessary because world sulfur needs for 1951 are expected to exceed supplies by about 1,000,000 tons, in spite of the fact that sulfur output reached a high of 12,050,000 tons in 1950, compared to 4,000,000 tons in 1935 and 8,687,000 short tons during 1945, the last war year.

Critical Materials Allocated

On May 11, NPA announced the allocation of polyethylene, effective June 1, to conserve its short supply to meet increasing military and essential civilian needs. The two companies which manufacture polyethylene are expanding production facilities, NPA said, but in the meantime defense rated (DO) orders and mounting industrial demands have exceeded the current supply.

NPA said, however, that essential needs can be met by conserving the supply for allocation to the most important uses. NPA said polyethylene would be allocated as an Appendix B material under M-45, a basic order which established the mechanism for the allocation of scarce chemicals.

Polyethylene manufacturers will be required to make application to NPA on NPA Form 47 for authorization to fill an order or to use the chemical themselves. The application will specify whether the material is flake or granular and will give its end-use by the purchaser. Filing date for applications is the 20th day of the month before the proposed delivery month.

Purchasers of polyethylene do not make application to NPA. Instead, they certify on their order to their supplier the end-use of the material, giving the quantity for each if there is to be more than one use. No authorization is necessary for companies which use less than 500 pounds a month. Secondary, scrap or reclaimed materials are not included in this schedule and thus require no authorization.

On May 17, NPA also acted to distribute increasing defense demands for high tenacity rayon yarn equitably among producers to prevent disruption of production schedules. In an amendment to Order M-13, NPA ruled that a producer will be required to accept defense rated (DO) orders for not more than 30% of his monthly scheduled production. The ceiling on DO orders previously was 15%.

High tenacity rayon yarn is used principally in the manufacture of tires. The yarn has other defense uses such as in bullet-sealing hose, aerial delivery and ammunition parachutes, and fabric for airplane fuel cells. It was pointed out that the amendment does not apply to textile yarn, used in making rayon hose and wearing apparel, and that other provisions of the order remain unchanged. The May 17 action will assure systematic and prompt filling of DO orders, NPA said.

NPA also announced, on May 11, that the allocation of resorcinol had become necessary as of June 1. Demand is exceeding supply by more than 35%, NPA said, and production facilities cannot be expanded rapidly enough to meet the increasing requirements. The action, Schedule 6 to NPA Order M-45, classifies resorcinol as an Appendix A chemical, requiring NPA authorization for delivery, acceptance and use.

Phenol Supply Short

In a meeting held on May 15, in Washington, D. C., the NPA and members of the Synthetic Phenol Industry Advisory Committee agreed that synthetic phenol will be in short supply for the next several months until new production equipment comes into use. NPA said the additional facilities which will be in production before the end of 1951 should add about 25,000,000 pounds to the estimated yearly production of 335,000,000 pounds of natural and synthetic phenol. Estimated requirements are 375,000,000 pounds.

The Barrett Division, Allied Chemical & Dye Corp., has applied for a Certificate of Necessity from the NPA covering additional facilities for the production of synthetic phenol at its chemical plant in Philadelphia, Penna. The projected expansion, which would treble Barrett's phenol productive capacity, would involve an expenditure of about $58,000,000.

U. S. Seeks German Benzol

According to authoritative sources, negotiations between the United States and Western Germany for the importation of a considerable quantity of benzol, are nearing completion. The requirements for benzol in 1951 are estimated at 250,000,000 gallons, a consumption that compares with 135,000,000 gallons in 1949 and 190,000,000 gallons last year.

NPA has also announced that the increasingly tight supply situation for methyl chloride may necessitate placing allocation controls upon the material. NPA estimated, on the basis of reports it had received from users of the chemical, that 1951 demand would total 42,591,000 pounds, about 5,355,000 pounds more than the expected production.

Chemical pigment producers have asked that the government require them to set aside only 20% of their production for the filling of chrome yellow DO rated orders. Currently there is no restriction on the number of DO's any producer must fill. A spokesman for the Industry Advisory Committee, which recently met with NPA officials in Washington, stated that a number of pigment producers are overburdened with DO's. NPA said it would consider the industry suggestion.

In meetings held in May, the Senate Small Business Subcommittee was told that a thriving black market exists in titanium dioxide. Thomas F. Millane, president of the Wright Manufacturing Co. of Houston, Texas, told the subcommittee he had received a dozen or more offers in the last year for titanium dioxide at three or four times the price asked by major producers. Subcommittee members promised an immediate investigation of the situation.

Plastics Producers Testify

On May 21, producers of plastic products told the Office of Price Stabilization that they need a tailored regulation soon because existing orders do not cover the industry's complex pricing problems. They asked for an order with a section on new products which are constantly under development by plastics fabricators. As a model, they pointed to sections in OPS's machinery regulation, CPR-30.

In addition, the producers said they could not be ready with price lists required by May 28 under the manufacturers' General Pricing Order CPR-22. The group was to have met again on June 5 to consider a new order. Synthetic plastic and resin producers, however, said they would give CPR-22 at least a 60-day try. Rollbacks and higher prices are expected to balance out under the order, they said.

Producing Lighter Fuel Cells

According to the B. F. Goodrich Co., new bullet-sealing fuel cells it is making for jet fighters and bombers are one-third lighter in weight than fuel cells used in World War II. Since fuel cells used on some of today's larger military airplanes weigh more than a ton, the new weight savings now possible may be measured in hundreds of pounds, the company said. Longer flying ranges result from such important reductions in weights. The new fuel cells have the same bullet-sealing characteristics as early, heavier World War II models. Development of the lightweight fuel cells stems from improved construction and manufacturing processes conceived in the postwar period.

Carbon Black Exports Controlled

Exports of furnace carbon black have been placed under quota control, the Office of International Trade of the Department of Commerce announced on May 17. The quota for the second quarter has been set at 30,000,000 pounds of furnace black. Channel black still is being licensed to meet requirements of friendly foreign countries without respect to a specific quantitative limitation. The quota is effective for the entire second quarter, April 1 through June 30, 1951, and a considerable quantity of furnace black already has been licensed for export against the quota.

GOVERNMENT RUBBER POLICIES CITED BY RICHARDSON IN TALK

The United States is heading into a rubber crisis which almost entirely has been brought about by government actions, W. S. Richardson, president of the B. F. Goodrich Chemical Co. and vice-president of the B. F. Goodrich Co., said in an address before the Society of Security Analysts in Cleveland, Ohio, on May 10. Mr. Richardson said that this summer there is going to be a very tight supply situation and the domestic economy which depends so greatly on rubber tires and tubes to keep it moving, is going to feel the pinch.

He explained that the government owns the nation's synthetic plants, supplies the raw materials and schedules the production, is the only buyer and importer of crude rubber, determines the amount of synthetic and crude that may be consumed each month and schedules shipments of both to the user, sets the specifications for the use of rubber, and determines the price and method of payment for all the rubber it sells.

"As things now stand," he said, "the government bears the sole responsibility for the success or failure of our country's rubber program. Government policies have forced the price up and have brought about scarcity through restrictions." He said that the rubber industry has consumed an average of 22 per cent less rubber in each of the first four months of this year than it used in August, the last month prior to government regulation.

"The net result has been great reduction in inventories of manufactured rubber articles including automobile tires and tubes and high prices to the American consumer." At the same time, he pointed out, a study of availability of crude and American rubber indicates that there will be a world surplus of crude rubber in 1951. Government policy has not only been instrumental in forcing the price of crude rubber to fantastically high figures he said, but also created a situation which will seriously affect our civilian economy.

Mr. Richardson said that there are indications that government will relax some of the restrictions on rubber consumption in May and June. He considers it doubtful, though, that even if this is done, that available additional rubber will be permitted in the manufacture of tires and tubes needed to avoid crisis in our transportation economy.

Named to Scrap Rubber Committee

Eight representatives of firms belonging to the National Association of Waste Material Dealers, Inc., have been named to the Executive Committee of the Scrap Rubber Institute by Henry M. Rose (Muehlstein), president of the group. Those named include: John J. Costello (Tanney-Costello), Thomas Crosby (Muehlstein), Louis Fishman (Louis Fishman), Ben Gordon (A. Schulman), Irving Levin (Superior Iron & Metal), A. Lowenstein (A. Lowenstein), P. F. Mekeal (Desser Tire), and Seymour Sacks (Ed Sacks).

Argus Chemical Moves Offices

Argus Chemical Laboratory announces the removal of its plant, offices and laboratory to 633 Court St., Brooklyn 31, N. Y. The new site will enable Argus to triple its production of "Mark" stabilizers and "Vinylum" aluminum powder dispersions, and to further its development of new products, several of which will soon be introduced. The company has always followed a program of rigid laboratory control in its production processes and the new facilities include four laboratories, complete with mill room, glass blowing room and a comprehensive library.

Argus Chemical was formed several years ago by Olga Knoepke, W. E. Leistner, and A. C. Hecker following many years as chemists in the rubber and vinyl field. Its first offering to the trade, "Vinylum," met with instant success. When the "Mark" stabilizers were added to the line, the initial plant was overtaxed and a new location, with possibilities for additional expansion, became necessary. The new location meets these requirements and the company is now in a position to make its products more freely available than heretofore.

The "Mark" stabilizers, according to the company, are being used with considerable success in high speed, high temperature operations of calenders and extruders, where they aid greatly in the maintenance of uniform color during long production runs, and in the production of vinyl goods resistant to heat and light.

Monsanto Forms Brazilian Subsidiary

Monsanto Chemical Co., St. Louis, Mo., has announced the formation of a new subsidiary company in Brazil, Monsanto S. A. Productos Quimicos e Plasticos. The new company will construct plants probably in the vicinity of Sao Paulo for the manufacture of vinyl chloride monomer and Ultron polyvinyl chloride resins and compounds. The new plants will have sufficient capacity to meet all immediately foreseeable Brazilian market demands, and construction will start in the near future. It is expected that production will begin in the latter part of 1952. Several Brazilian interests have joined with Monsanto to form the new company which will be under the general supervision of Monsanto's Foreign Department. The technical management of the new plant will be under the direction of the company's Plastics Division, which developed the processes to be employed.

Walsh Named Sales Agent

John E. Walsh has been appointed manufacturers' agent for the Preventive Maintenance Co., Bridgeport, Conn. Mr. Walsh, who has a background of 25 years' experience as a rubber chemist, will represent the company in the states of New Jersey, Pennsylvania, Delaware and Maryland for the sale of "Rubber-Flo" and "Rubber-Sol," the firm's mold lubricants. Mr. Walsh also represents the Stamford Rubber Supply Co. and Dagmar Chemical. He maintains offices at 105 Washington St., Trenton 9, N. J.

BRITAIN STOCKPILING RUBBER AS CHINA SHIPMENTS ARE CUT

According to authoritative sources in London, Great Britain is building up a strategic stockpile of more than 100,000 tons of natural rubber, half of which was originally destined for Communist China. Rubber producers estimated the British government will buy up to 50,000 tons of rubber from Malaya and other Commonwealth sources which were sold to China but not delivered before the ban on shipments to the Communists went into effect. Officials said the British purchases will compensate suppliers for their loss resulting from the China ban, and will be in addition to regular rubber imports from Commonwealth sources. The ban had been announced on May 10.

Both British Malaya and the Crown Colony of Singapore announced a ban on the shipments of rubber to Communist China on May 22. The first visible evidence of the British ban on rubber shipments to Communist China came on May 18 when a British naval vessel intercepted a freighter on route from Singapore to China carrying a cargo of Malayan rubber. The freighter was escorted back to Singapore.

Sir Hartley Shawcross, president of the British Board of Trade, told the House of Commons on May 31 that Britain's sales of rubber to the Soviet Union, Poland, Czechoslovakia, Hungary and Rumania, between January 1 and April 1, amounted to 4,361 tons. Exports of raw rubber from Malaya to the Soviet Union in the same period totaled 14,425 tons and to the other countries in the Soviet Bloc 4,917 tons, he said. Britain, he said, had received a greater quantity of vital materials from Red China than she had sent in.

Heyden Boosts Resorcinol Output

Heyden Chemical Corp., New York, N. Y., has completed plans to triple its production of resorcinol. The resorcinol plant at Garfield, N. J., partially destroyed by fire in February, is being rebuilt with doubled production of 600,000 pounds annually, company officials said. The National Production Authority is expediting directives necessary to secure the equipment required to put the Garfield resorcinol plant back into production. Heyden also plans to apply to NPA for a Certificate of Necessity to construct additional plant capacity to raise its resorcinol production to 1,000,000 pounds annually. Koppers Co. and Heyden Chemical are the only producers of resorcinol in the country. The Chemical Division of the Borden Co. recently applied to NPA for a Certificate of Necessity to construct a resorcinol plant at Tacoma, Wash. Total resorcinal production in the U. S. is currently estimated at approximately 4,000,000 pounds annually.

General Electric X-Ray Corp., a manufacturing affiliate of the General Electric Co. at Milwaukee, Wisc., will become a department of the parent organization on June 30. The X-Ray Department will function as part of the Apparatus Group.

FIRESTONE AND CITIES SERVICE FORM PETROCHEMICALS COMPANY

Formation of the American Petrochemical Corp. for the manufacture of essential chemicals from petroleum hydrocarbons was recently announced by the Firestone Tire & Rubber Co. and the Cities Service Co. The new company has developed plans for construction of a large modern chemical plant, the production of which ultimately will encompass the broad fields of plastics, synthetic rubber, additives for lubricating oil, cracking catalysts, anti-freeze and many high volume petrochemicals.

A site at Lake Charles, Louisiana, is under consideration for the new plant. Cities Service owns and operates at Lake Charles a 160,000 barrel refinery, which would be a source of supply of light hydrocarbons for the chemical plant. Firestone operates a government-owned synthetic rubber plant adjacent to the refinery. The growing emergency requirements of the armed forces, including greatly increased demand for a wide range of chemicals and for such finished products as synthetic rubber, fibers and plastics, were important factors in planning the chemical plant.

Ownership of the corporation will be equally divided between the two companies. The association of Cities Service and Firestone is particularly advantageous because of their joint interest in the future of synthetic rubber and other products derived from hydrocarbons, and the fact that the petroleum and natural gas resources of Cities Service Company joins with Firestone's established position in the plastics industry.

Jammal Joins Hershberg Products

Nicholas J. Jammal, works manager and a director of the Vulcanized Rubber & Plastics Co. Since 1944, and associated with that company since 1937, has resigned to join the Hershberg Products Co., Ashtabula, Ohio, as a partner. A farewell dinner was given to Mr. Jammal at the Hotel Hildebrecht in Trenton, N. J., on May 29 by his associates of Vulcanized Rubber, with Prescott Beach, president of the company, acting as toastmaster. Mr. Jammal joined Vulcanized Rubber in 1937 as a night foreman. In succession he became chief inspector, rubber superintendent, and works manager. Previously, he had been associated with the Advance Rubber Co. of Akron and the Aetna Rubber Co. of Cleveland and Ashtabula, Ohio.

Fremont Rubber Elects Officers

At a recent meeting of the board of directors of the Fremont Rubber Co. at Fremont, Ohio, Arthur O. Dittman, secretary, was elected president of the company, succeeding Robert P. Johnson. The latter retains his positions as chairman of the board and treasurer. Both Wallace C. Gilbertson and Harlan L. Lea were elected vice-presidents and Arthur P. Reed as secretary. Van R. Kanan was named controller. Officers re-elected include Paul Clark, executive vice-president, and Eldon R. Frazier, vice-president.

SWEATT AND CARPENTER NAMED GOODRICH TIRE PLANT MANAGERS

James F. Sweatt

William L. Carpenter

James F. Sweatt, manager of the B. F. Goodrich Tire Co. plant at Oakes, Penna., since 1943 has been named manager of the company's Los Angeles, Calif., tire plant succeeding Laurence R. Keltner, who has been named director of employee relations for the company. William L. Carpenter, formerly production superintendent of the company's tire plant in Miami, Okla., has been named manager of the Oaks plant succeeding Mr. Sweatt. G. Allen Paulding, associated with the company since 1940, has been named to succeed Mr. Carpenter as production superintendent of the Miami plant.

Mr. Sweatt joined Goodrich in 1923 as a factory employee. He was transferred to Los Angeles as supervisor when the Goodrich plant was opened in 1928. He remained there until 1943 when he was named manager of the Oaks tire plant. Mr. Carpenter has been associated with Goodrich for 16 years. He was graduated in chemistry from Northwestern University. Before going to the Miami plant last year, Mr. Carpenter had been assistant to the general manager of the company's Tire Division. Mr. Spaulding is a graduate of Ohio University and is an industrial engineer.

Plan Fifth Plastics Exposition

The Fifth National Plastics Exposition sponsored by the Society of the Plastics Industry will be held on March 11 through 14, 1952, at Convention Hall in Philadelphia, Penna. With a large number of plastic products finding increasing use in military applications, the exposition will be of particular value to the military and those desiring to do business with them. Companies exhibiting at the exposition will represent every branch of the plastics industry among which will be molders, extruders, laminators, reinforced plastics manufacturers, film and sheeting processors, fabricators, material manufacturers, machinery manufacturers, and others. Information about the exposition may be secured from the Society.

Elastomer Group Hears Sell

The Elastomer and Plastics Development Group of the New England Section, American Chemical Society, held a meeting on May 17 at the Massachusetts Institute of Technology. Principal speaker was Harold S. Sell, Chemical Products Development, Goodyear Tire & Rubber Co. Mr. Sell's address on "High Styrene Resins" featured a discussion on the uses of Goodyear's Pliolite S-6 and S-6B as rubber reinforcing agents and in hard impact resistance stocks.

NAWMD Moves to New Offices

National Association of Waste Material Dealers, Inc., have moved their headquarters from the Times Tower in New York, N. Y., to 271 Madison Avenue in New York. Chief reason for the move was the current all-time high in NAWMD membership which necessitated larger headquarters. The new offices provide almost double the area of the former quarters and offer better working facilities. In addition to the offices, a special conference room is included. The new telephone number is MUrray Hill 4-4147.

Firestone Awarded Navy Contract

A $62,000,000 contract for the construction of new-type three-inch twin anti-aircraft guns and mounts has been awarded the Firestone Tire & Rubber Co. by the Bureau of Ordnance, United States Navy. The new gun, a development of Navy Ordnance, will be installed on board ships to replace four-gun 40-mm. mounts which were used during World War II. The Firestone contract covers tooling, materials and spare parts. Approximately 1,200 persons are scheduled to be employed in Akron when production begins. Many of the machined parts will be manufactured by subcontractors.

WASHINGTON ELECTS OFFICERS: HEARS INTERESTING ADDRESSES

New officers of the Washington Rubber Group, elected by letter-ballot during May, were announced at the May 22 meeting, held at the Cosmos Club in Washington, D. C. The new officers will take office in October and will serve a 12-month term. Officers elected are: *President,* T. R. Scanlan (Gates Rubber); *Vice-President,* Norman Bekkedahl (Bureau of Standards); *Secretary,* Gerald Reinsmith (Ordnance Dept.); *Treasurer,* Philip Mitton (Corps of Engineers); *Recording Secretary,* Ethel Levene (Bureau of Ships).

The technical session of the meeting was devoted to an address by Hubert D. Harris, manager, Textile Division, Technical Department, Gates Rubber Co. Mr. Harris spoke on "Trends of Textile Demands by the Rubber Industry." The speaker reported on the comparative characteristics and value to the rubber industry of a number of textile fibers, including cotton, rayon, nylon and several newly-developed synthetic fibers.

Mr. Harris said that the rubber industry is one of the largest consumers of textile materials. As such, it influences, to a great extent, development and demand trends for textiles. Progress in both the textile and rubber fields has continued hand in hand throughout the years.

A statement which can be debated but which has good basis if the history of the tire is read is that the greatest improvement in tire quality has resulted from the ingenuity of textile engineers and every major improvement is directly traceable to changes in the textile reinforcing member, Mr. Harris stated.

Viscose rayon cord has greatly improved the quality and performance of truck tires. Future trends point to the use of nylon in some truck sizes. Tire growth, a fault of nylon, is being minimized. As a result, a large market is opening for nylon heavy-duty tires. Not only is it possible to reduce the weight of the textile used, but the over-all weight of the tire is decreased considerably. Importance of tire weight to the trucker is recognized when it is known that every pound reduction in tire weight means $1.75 more revenue per year.

What about the other uses of cotton in the rubber field—chafers, ducks, V-belt cords, etc., Mr. Harris asked. V-belt cords are already over to synthetics and have been for several years. Rayon fabric has been priced high. The economic balance has swung at the present time, however, and tends to favor rayon. If the disparity in price continues as it now is, greater usage of rayon in chafers for tires and V-belts and ducks for hose may be expected. Because of the cost conscious nature of the rubber industry, it is difficult to see how King Cotton can even hold the lesser degree of eminence it now holds.

Part of the challenges to the fiber industry, which the rubber industry has presented, is being accepted by the engineers, chemists and production men of the textile field. Improvement of textiles is one answer to improved products and greater serviceability. The challenge to use the improved textiles to the best advantage rightfully belongs to the members of the rubber industry, Mr. Harris concluded.

Addresses April 24 Meeting

At a meeting of the group held on April 24 at the Cosmos Club, John T. Blake, research director of the Simplex Wire & Cable Co., spoke on "Rubber in Electrical Wire and Cables." Dr. Blake said the wire and cable industry has turned to synthetics because of their "technical virtues." GR-S and Butyl are used in insulations because they give properties superior to those obtained from natural rubber, he said. The large use of neoprene, on the other hand, is due to substantial price reductions rather than newly-developed properties. This price reduction, he added, has allowed the industry to take advantage of its superior technical properties without paying "too high a price penalty."

Reviewing in detail the performance of synthetic rubbers in the wire industry, Dr. Blake pointed out that "toughness" to withstand installation and service hazards is the physical property which "as a practical matter we demand in an electrical insulation." While GR-S is the primary rubber used in wire insulations, the speaker declared that Butyl is proving a most desirable material because of its inherent resistance to degradation through heat and oxidation. Neoprene, he added, is the preferred material for jacketing.

BUFFALO AND ONTARIO HOLD 10th INTERNATIONAL MEETING

Approximately 190 members and guests of the Buffalo Rubber Group and the Ontario Rubber Section of the Chemical Institute of Canada attended the 10th Annual International Dinner Meeting held at the General Brock Hotel in Niagara Falls, Ont., Canada, on May 18. Principal speaker of the meeting was Dr. Ira Williams, research director for the J. M. Huber Corp. Dr. Williams spoke on "Chemical Activity and Oxidation of Rubber."

Rubber Molecule Structure

Dr. Williams began his talk by giving a brief description of the structure of the rubber molecule. He then discussed the behavior of rubber in solvents and their effects on viscosity. He also outlined the swelling properties of the various solvents in rubber. The speaker explained some recent studies of reactions of sulfur with rubber. This included the mechanism of the reactions, rates of reaction and comparisons with bromine, chloro-acetic acid and zinc propionate.

The speaker also talked on the degrading action of oxygen on rubber. Small amounts of oxygen will destroy the tensile properties of rubber. The rubber, however, retains its rebound properties with the addition of oxygen. Some of the types of oxidation encountered are massive oxidation and surface oxidation, the latter taking place on unstrained rubber. On strained rubber there are mastication oxidation and sun or ozone checking. Dr. Williams used slides to illustrate his talk.

AMERICAN INSTITUTE OF CHEMISTS HOLDS ANNUAL MEETING IN CANADA

The Annual Meeting of the American Institute of Chemists was held this year on May 10 at the General Brock Hotel in Niagara Falls, Ont., Canada. The meeting was addressed by Dr. R. P. Dinsmore, vice-president in charge of research of the Goodyear Tire & Rubber Co.; Donald A. Kohr, Jr., technical director, Institutional & Special Products, Sherwin-Williams Co., and W. A. Wiard, technical director of the Dow Corning Corp.

In his paper on "Rubber, Plastics and Chemicals—the Human Element," Dr. Dinsmore noted that the results of research are valueless until they enable the achievement of some useful human purpose. Utilization of the pertinent human factors is as important to the accomplishment of this objective as is the construction of a correct scientific foundation, he stated.

While emphasizing the importance of satisfying the human side of business organizations, Dr. Dinsmore said, with respect to new product commercialization, he had no intention of belittling the role of adequate research preparation, piloting, market survey and testing, patent survey and organization directed toward synchronized sales service, research and product improvement.

Mr. Kohr, in a paper on "Emulsion Paints," observed that the paint industry has undergone several interesting technical revolutions in the past half-century. The development of phenolic resins gave the chemist formulator a tool for increasing the drying speed of paint films, as well as their durability, he said. The speaker also discussed the development of lacquer and the introduction of titanium dioxide and alkyd resins.

Mr. Kohr stated that resin-emulsion base finishes made their debut in the late 1930's and early 1940's. He also discussed the rapid adoption of the styrene-butadiene latices as emulsion paint binders for their properties in imparting a greater degree of color uniformity to the paint film than resin-emulsion binders. Mr. Kohr displayed samples of typical resin and latex emulsion base paints during the course of his talk.

Another interesting paper was presented by Mr. Wiard, who spoke on "Progress in Silicones." Mr. Wiard outlined recent progress made in the technology of the silicones and described their use in various products.

To Double British Output

Cabot Carbon, Ltd., the British subsidiary of Godfrey L. Cabot, Inc., of Boston, Mass., which operates a carbon black plant at Avonmouth, England, has announced that it would double the production capacity of the British plant, bringing it up to an output of 40,000,000 pounds a year. Construction of the Philblack O unit at Avonmouth was completed several weeks ago and has been in continuous operation since. Construction of the Philblack A unit is expected to be completed within the next few weeks, according to a recent announcement.

CONNECTICUT RUBBER GROUP HEARS INTERESTING TALK BY TREICHLER

The May 11th meeting of the Connecticut Rubber Group held at the United Illuminating Co. Auditorium in New Haven, Conn., featured an address by Dr. Raymond Treichler of the Chemicals & Plastics Section, Research and Development Branch, Military Planning Division, Office of the Quartermaster General, Washington, D. C. His address was entitled "Application of Fungicides to Rubber-Like Polymers and Related Materials." Two movie shorts, "Coaxial Cable" and "Stepping Along With Television," were shown through the courtesy of the Southern New England Telephone Co.

In his address, Dr. Treichler stated that vulcanized natural rubber, GR-S neoprene, Butyl, Thiokols and rubbers of the butadiene-acrylonitrile copolymer class, such as Hycar and Perbunan, are relatively free from fungal attack. What growth does occur is related to surface contamination or occluded fungus vulnerable material. There is no need for inclusion of fungicidal agents in rubber to protect against loss of mechanical properties.

Synthetic resins such as polyethylene, polymethylmethacrylate, polystyrene, polyvinyl acetate, polyvinyl chloride, phenol-formaldehyde, melamine-formaldehyde, and urea formaldehyde are resistant to fungi. The use of cellulosic fillers or laminates and oil-based plasticizers may require the use of fungicides for maximum protection. Phthallic acid and phosphoric acid derived plasticizers are generally resistant to fungal attack.

Base fabrics of cotton or rayon must be impregnated with a suitable fungicide to provide maximum retention of tensile strength in tropical areas. Suitable rapid preliminary screening methods have been developed and practical testing procedures for evaluating mildew resistance of varying classes of plastic films and coated fabrics have been established.

Celebrates 100th Birthday

Morningstar, Nicol, Inc., 630 W. 51st St., New York 19, N. Y., nationally known manufacturers of starches, dextrines and adhesives, marked the 100th anniversary of the founding of the company on May 1. During the balance of the year there will be a series of events to celebrate the occasion. Morningstar, Nicol has a number of subsidiary companies including Paisley Products, Inc., of Chicago, Ill. The company owns manufacturing plants in New York, Chicago, Hawthorne, N. J., and Houlton, Maine.

Phillips to Build Sulfur Plant

Phillips Chemical Co. has announced plans for the construction of a large sulfur extraction plant in West Texas. The plant is designed to extract from natural gas 250,000 pounds of elemental sulfur per day and will be located in the Permian Basin oil fields near Goldsmith, it was said. The output will be used by the company in connection with its ammonium fertilizer plant at Adams Terminal near Houston.

Coming Events

June 22. Detroit Rubber & Plastics Group, Summer Outing, Forest Lake Country Club, Pontiac, Mich.

June 23. Southern Ohio Rubber Group, Summer Outing, McCrabb's Grove, Dayton, Ohio.

Jury 20. Buffalo Rubber Group, Summer Outing.

Aug. 3. Chicago Rubber Group, Summer Outing, Medinah Country Club, Chicago, Ill.

Aug. 7. New York Rubber Group, Golf Tournament, Baltusrol Club, Springfield, N. J.

Aug. 24. Philadelphia Rubber Group, Summer Outing, Cedarbrook Country Club, Philadelphia, Penna.

Sept. 3-7. American Chemical Society, 75th Anniversary Jubilee Meeting, New York.

Sept. 5-7. Rubber Division, A.C.S., Commodore Hotel, New York, N. Y.

Sept. 10-13. Section on Elastomers and Plastomers, 12th International Congress of Pure and Applied Chemistry, New York, N. Y.

Oct. 5. Detroit Rubber & Plastics Group, Fall Meeting, Detroit-Leland Hotel, Detroit, Mich.

Oct. 19. Akron Rubber Group, Mayflower Hotel, Akron, Ohio.

Oct. 19. Boston Rubber Group, Fall Meeting, Somerset Hotel, Boston, Mass.

Oct. 23. Buffalo Rubber Group, Fall Meeting, Hotel Westbrook, Buffalo, N. Y.

Oct. 23. Washington Rubber Group, Annual Banquet, Cosmos Club, Washington, D. C.

Oct. 26. New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

Nov. 14-15. Rubber-Stichting, International Symposium on Abrasion and Wear, Delft, Holland.

Nov. 16. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Dec. 14. Boston Rubber Group, Xmas Party, Somerset Hotel, Boston, Mass.

Dec. 14. Detroit Rubber & Plastics Group, Xmas Party, Detroit-Leland Hotel, Detroit, Mich.

Dec. 14. New York Rubber Group, Xmas Party, Henry Hudson Hotel, New York, N. Y.

Dec. 18. Buffalo Rubber Group, Xmas Party.

Oct. 29-31, 1952. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Statler, Buffalo, N. Y.

DETROIT MEETING FEATURES TALK ON USE OF CALCIUM CARBONATES

The Spring Meeting of the Detroit Rubber & Plastics Group held on April 27 at the Detroit-Leland Hotel in Detroit, Mich., featured an address by Victor H. Vodra, sales manager of calcium carbonates for the Wyandotte Chemical Co., Wyandotte, Mich. Mr. Vodra spoke on "White Carbon Black—What Is It?"

In his talk, Mr. Vodra emphasized the fact that there are many grades of calcium carbonates which may be used to give different desired properties in rubber in the same way that there are many grades of carbon black which impart various physical properties to rubber. Grading of calcium carbonates is usually accomplished by particle size, ranging from coarse limestones to fine precipitated carbonates. Rubber is stiffened by the coarse materials while the fine materials have a reinforcing effect, he said.

By taking advantage of the reinforcing values of the fine sized carbonates, it is possible to make scarce rubber go further by increased loadings. Microns of 0.1 and smaller impart increased tensile strengths with corresponding increases in tear resistance, Mr. Vodra said. Carbonates can be used to advantage in both white and colored stocks with materials of 0.2 to 0.5 micron size having the greatest hiding power. The selection of the proper carbonate will insure decided savings on any given job, he concluded.

Philadelphia Hears Bascom

Approximately 115 members and guests of the Philadelphia Rubber Group attended the May 11th meeting held at the Poor Richard Club in Philadelphia, Penna. Principal speaker of the evening was Roger C. Bascom, technical service manager, Hycar Rubber and Chemicals, B. F. Goodrich Chemical Co. Mr. Bascom's address was similar to one he delivered before the New York Rubber Group on March 30, a full report on which appeared in the April, 1951, issue of RUBBER AGE. It was announced at the meeting that G. N. Vacca of the Bell Telephone Laboratories would address the group on November 16 at the Poor Richard Club. Dr. Warren G. Stubblebine of the Quartermaster Department will address the meeting to be held on January 25, 1952.

Armed Forces Plan Exhibit

The United States Army, Air Force and Navy have jointly issued an invitation to manufacturers in the Southwest, South, Midwest and Rocky Mountain areas to attend an exhibit of materiel to be held the week of June 25-30 in the Will Rogers Memorial Stadium, Fort Worth, Texas. In the exhibit, prime contractors will display products they are now making for the Armed Forces for inspection by manufacturers who are potential subcontractors of such work. The exhibit is supported by the Munitions Board's Armed Forces Regional Councils. Small business firms interested in the exhibit are invited to communicate with the Project Officer, Armed Forces Small Business Exhibit, P. O. Box 9038, Fort Worth, Texas.

Novadel-Agene Buys Hardesty

Novadel-Agene Corp. of Belleville, N. J., has acquired a majority of the common stock of the W. C. Hardesty Co., Inc., New York, N. Y. Hardesty and its subsidiaries manufacture various fatty acids and plasticizers used in the rubber, plastics and other industries. It maintains plants in Dover, Ohio, and Toronto, Ont., Canada. Novadel-Agene leases equipment to flour millers for bleaching, maturing and aging wheat and is also in the plastics field. M. F. Tiernan, president of Novadel-Agene, said the purchase was made to further diversify his company's activities and "to enhance its earning power." He added the stock had been purchased with company funds and the proceeds of bank loans. Mr. Tiernan said at present Novadel-Agene's equity in the Hardesty group of companies is producing earnings at an annual rate of approximately $1 a share after taxes on Novadel-Agene stock. He explained directors believe these earnings should, to a considerable extent, be retained in the business for a sufficient length of time to help reduce bank loans and in the interest of improving the Hardesty property.

Large Carbon Black Expansion

Certificates of necessity have been granted by the Defense Production Administration to practically every domestic manufacturer of carbon black for new or expanded facilities in line with the defense program. The certificates authorize the holders to deduct from taxable income from 40 to 100% of the cost of the facilities during the next five-year period. Companies, locations and amounts approved included the following: Phillips Chemical Co., near Borger, Texas, $4,668,999; General Atlas Carbon Co., Big Spring, Texas, $1,545,050; Continental Oil Black Co., Westlake, Louisiana, $1,890,500 and $1,514,300; Cabot Carbon Co., Ville Platte, Louisiana, $732,028; J. M. Huber Corp., Aromex, Texas, $2,211,242; Cabot Carbon Co., Bayou Sale, Louisiana, $2,174,380; United Carbon Co., Lake Charles, Louisiana, $2,290,000; Columbian Carbon Co., El Dorado, Arkansas, $1,670,000.

Clopay Closeal Molding Material

The Industrial Products Division of the Clopay Corp., Cincinnati, Ohio, has announced the availability of "Closeal," a putty-like molding material similar to modeling clay. Currently, the product is developing substantial interest among design and pre-production departments for the purpose of producing mock-up and prototype parts and assemblies. The material can be molded by hand, as is sculptor's clay, to form any desired shape, after which it can be baked at temperatures in the vicinity of 350° F. to produce a model in permanent form. "Closeal" is available in a range of colors and hardnesses. Prior to the baking operation, "Closeal" is uniformly soft and workable. After the baking operation, however, it is converted to either a hard rigid material or to a soft form having a Durometer in the vicinity of 50 (Shore A).

Resumes Fuel Cell Production

Firestone Tire & Rubber Co., a major producer of bullet-sealing gasoline and oil tanks in World War II, is again turning out thousands of these rubber-fabric fuel cells that fit into the wings and fuselages

of the Air Force's newest fighters and bombers. Although a bullet may pass through these fuel cells, a rubber sealant immediately closes the bullet hole to prevent leakage and to minimize fire hazards. Two of the most unusual shapes produced by Firestone are pictured above. They are self-sealing leading edge wing fuel cells for jet fighters.

Goodyear Plans Topeka Expansion

An increase in the output of its Topeka, Kansas, plant by 50% at an estimated cost of approximately $10,000,000 is planned by the Goodyear Tire & Rubber Co. When completed, the program will provide employment for about 500 additional persons and will make the Topeka operation one of the country's top producers of track and military tires. The plant now employs 1,000. The expansion program calls for some 500,000 additional square feet of space for machine shop, power house, warehouse and shipping facilities, the company stated.

Chicago Plans Annual Outing

The annual outing of the Chicago Rubber Group will be held on Friday, August 3, at the Medinah Country Club in Chicago. Festivities will begin with golf at 9:00 A.M. and end with dinner at 7:00 P.M. The club's tennis courts and swimming pool will be available to the group. Prizes will be awarded for various planned events, including the golf tournament. James T. Adams, of Sears, Roebuck & Co., heads the outing committee for the Chicago group.

Rubber Division Plans 1952 Meeting

The Division of Rubber Chemistry of the American Chemical Society has announced plans to hold its Fall Meeting for 1952 on October 29, 30 and 31 in Buffalo, N. Y. Headquarters for the meeting will be the Hotel Statler.

Robins Named RMA Director

Thomas Robins, Jr., president of Hewitt-Robins Inc., and president of the Kentucky Synthetic Rubber Corp., has been elected a director of the Rubber Manufacturers Association. Four other directors were re-elected for three year terms to the Association's fifteen member board. The re-elected directors are: C. D. Garretson, president of the Electric Hose & Rubber Co.; H. E. Smith, vice-president of Raybestos-Manhattan, Inc.; J. P. Seiberling, president of the Seiberling Rubber Co., and H. S. Marlor, vice-president of the U. S. Rubber Co. A. L. Viles, president; W. I. Sears, vice-president; R. R. Ormsby, vice-president and general counsel; C. W. Halligan, treasurer; R. H. Goebel, secretary, and all other officers of the association were re-elected. The new director, Mr. Robins, succeeds the late J. Newton Smith, president of the Boston Woven Hose & Rubber Co. Mr. Robins is a member of the Rubber Industry Advisory Committee to the Munitions Board and the Department of Commerce and serves as an advisor to the U. S. delegate to the International Rubber Study Group.

Offers New Sun Exposure Service

J. Paul Wilson, who retired from the Ford Motor Company on March 1 where he was in charge of the rubber and plastics laboratory, has organized the Wilson Testing Laboratory at Clearwater, Florida, specializing in sun exposure evaluation for rubber, plastics, paints and fabrics. While with the Ford organization, Mr. Wilson acted as the company's representative on numerous A.S.T.M. and S.A.E. committees concerned with rubber. He was particularly active with the joint ASTM-SAE Technical Committee on Automotive Rubber and helped write many of the specifications now being used. The address of the Wilson Testing Laboratory is Box 240, Route 1, Clearwater, Florida.

Form Lukens Chemical Co.

Lukens Chemical Co. has been organized at 227 California St., Newton 58, Mass., to sell pigments to the rubber, plastics, paint and allied industries in the New England area. Officers of the new company include Alan R. Lukens, who has had more than 30 years of technical experience in the rubber and allied fields, and Donald N. Lukens. An asset to the new company will be the research and testing facilities of the Lukens Laboratories. Among pigments being offered to the trade by the Lukens Chemical Co. is "Laminar," the high-loading extender pigment produced by the Laminar Corp.

Eagle Occupies Larger Quarters

Eagle Industries, Inc., dealers in used and rebuilt machinery for the rubber, plastics and allied industries, has moved to new and larger quarters at 110 Washington St., New York 6, N. Y. The move, in the same building occupied by the company for some time, was made to give the company's customers better service in view of the demands occasioned by the mobilization program.

USE STATEX·R

Note

To help supply the current heavy demand our production facilities have recently been doubled

• A COLUMBIAN COLLOID •

COLUMBIAN CARBON CO. • BINNEY & SMITH CO.

Manufacturer — Distributor

MPC (Medium Processing Channel)

STANDARD MICRONEX

◆

EPC (Easy Processing Channel)

MICRONEX W-6

◆

HAF (High Abrasion Furnace)

STATEX-R

◆

FF (Fine Furnace)

STATEX-B

◆

FEF (Fast Extruding Furnace)

STATEX-M

◆

HMF (High Modulus Furnace)

STATEX-93

◆

SRF (Semi-Reinforcing Furnace)

FURNEX

◆

COLUMBIAN CARBON CO.
MANUFACTURER

BINNEY & SMITH CO.
DISTRIBUTOR

NAMES IN THE NEWS

RICHARD B. STEINMETZ, associated with the Anaconda Wire & Cable Co. for the past 22 years and now serving as general manager of mills with headquarters at Hastings-on-Hudson, N. Y., has been elected a director of the company.

DR. MERVIN J. KELLY, formerly executive vice-president of the Bell Telephone Laboratories, has been elected president succeeding DR. OLIVER E. BUCKLEY, recently named chairman of the new Science Advisory Committee of the Office of Defense Mobilization.

JOSEPH M. HAMILBURG, president and a director of the Plymouth Rubber Co., Canton, Mass., has been elected to the board of directors of the Aspinook Corp., Jewett City, Conn.

LUTHER W. "RED" REEVES, formerly associated with Binney & Smith Co. at Akron, Ohio, has joined the Chemical Division of the General Tire & Rubber Co. at Akron.

GORDON BROWN, a vice-president of the Bakelite Co., a Division of Union Carbide & Carbon Corp., has been elected president of the Society of the Plastics Industry, Inc.

J. F. MACKEY, formerly chief chemist of the Continental Carbon Co. at Amarillo, Texas, has joined the Sid Richardson Carbon Co. at Odessa, Texas, as manager of product evaluation.

G. N. VACCA, of the Bell Telephone Laboratories at Murray Hill, N. J., has been named a member of the Wire and Cable Technical Committee of the NPA Industry Operations Bureau.

ALFRED J. OXENHAM, previously associated with the Merrimac Division of the Monsanto Chemical Co., has been named technical representative in the Product Development Department of the Pittsburgh Coke & Chemical Co., Pittsburgh, Penna.

WALTER P. JACOB, president of the Hartford Electric Steel Corp., has been elected executive vice-president of Colt's Manufacturing Co., Hartford, Conn.

BYRON A. FAY, a director and vice-president in charge of manufacturing for the Electric Auto-Lite Co., has been elected vice-chairman of the board. H. E. HASEMEYER, formerly vice-president, has been named executive vice-president of the firm. JOSEPH H. LAMBRIX, previously in charge of purchases, has been appointed vice-president and director of purchases.

HAROLD P. GRAMLEY, associated with the B. F. Goodrich Chemical Co., has been elected president of the Akron Junior Chamber of Commerce.

HOWARD BERRY, formerly vice-president, treasurer, and director of the Mathieson Chemical Corp., has joined R. S. Aries & Associates, consulting engineers of New York City, as senior associate.

HARDING MILLER, formerly associated with A. Schulman, Inc., has joined the George Woloch Co., New York, N. Y., in charge of sales of scrap rubber and plastic material in the mid-west area.

E. J. THOMAS, president of the Goodyear Tire & Rubber Co., was recently presented with a service pin marking the completion of thirty-five years with the company.

W. C. MILLER, treasurer of the Industrial Rayon Corp. since 1945, has been elected controller and treasurer of the company.

VICTOR H. TURKINGTON, associated with the Bakelite Co., a division of Union Carbide and Carbon Co., since 1920, has been appointed director of research for the company.

LAURENCE R. KELTNER, manager of the Los Angeles, Calif., tire plant of the B. F. Goodrich Co. since 1947, has been named director of employee relations for the company, with headquarters at Akron.

GEORGE LOW, associated with the B. F. Goodrich Co. for six years, has been named operating manager of the International B. F. Goodrich Co. succeeding JOHN R. WATKINS, who has been appointed operations and credit manager of the International Rubber Co., Manila, Philippine Islands, a subsidiary sales company.

FRANK B. WOLCOTT, formerly in charge of manufacturing operations for the New Jersey Zinc Co., has been named general manufacturing manager of the Wyandotte Chemicals Corp.

C. A. LITZLER, president of Industrial Ovens, Inc., Cleveland, Ohio, left the United States on May 8 for a two-month visit to 19 major industrial centers in Western Europe.

I. T. MEYER, associated with the Industrial Rayon Corp. since 1928, has been named vice-president in charge of manufacturing for the company, with headquarters at the company's executive offices in Cleveland, Ohio.

CLEMENT A. DAMEN, associated with the sales organization of the Witco Chemical Co. for the past 25 years, has been appointed manager of the company's Washington, D. C., office, located at 1111 Seventeenth St., N. W., Washington 6, D. C.

VERNON W. COLBY, previously sales representative for Emery Industries, Inc., Cincinnati, Ohio, has been named an assistant chemical sales manager of the company.

HERBERT H. CLARKE, JR., formerly manager of West Coast activities of the Chemical Division of the Borden Co., has been elected a vice-president of the division. CHARLES W. NIEDERAUER, previously manager of general services and assistant to the president of the division, has also been elected a vice-president of the division.

DR. EUGENE MCCAULIFF, formerly in charge of technical service and development for the Glyco Products Co., Brooklyn, N. Y., has been elected vice-president in charge of sales for the company.

DR. JAMES W. MCRAE, associated with the Bell Telephone Laboratories since 1937, has been appointed vice-president in charge of the Development Department.

LESTER F. COX, associated with the Thermoid Co., Trenton, N. J., since 1939, has been elected senior vice-president of the company. LAURENCE C. WARD, JR., with the company since 1948 as controller, has been elected a vice-president of the firm.

RICHARD C. EMMONS, associated with the U. S. Rubber Co. since 1936, has been appointed sales manager of Koylon foam mattresses, Koylon foam pillows, U. S. Rug underlay and U. S. non-slip in the national branch sales organization of the company.

HARRY L. ERICSON, formerly associated with the research laboratories of the Witco Chemical Co., has been named chief chemist of the Continental Carbon Company's new laboratory at Amarillo, Texas. T. A. RUBLE, previously associated with the Phillips Petroleum Co., has joined Continental Carbon at Amarillo as technical supervisor.

CHARLES H. SCHROEDER associated with the B. F. Goodrich Co. since 1921, has been appointed technical manager of textiles in the Industrial Products Division of the company succeeding the late CLARENCE W. BREES.

GLEN E. WILSON, formerly a representative of the Employee Relations Department of the B. F. Goodrich Chemical Co., has been named director of employee relations, a newly-created post of the company.

ANTHONY J. ZINO, JR., formerly assistant to the president of the Swan-Finch Oil Corp., has been appointed domestic general sales manager of the Joseph Dixon Crucible Co., Jersey City, N. J.

A. BLAIR SUTTON, formerly engaged in production and scheduling work with the B. F. Goodrich Co., has been appointed supervisor of weight control of the Sun Rubber Co., Barberton, Ohio.

HEWITT-ROBINS SETS PURCHASE OF BELFER FOAM RUBBER PLANT

The foam rubber capacity of Hewitt-Robins Inc. will be increased by 50 percent through the acquisition of the rubber plant of the Belfer Corporation on Staten Island, it was announced on May 28 by Thomas Robins, Jr., president of Hewitt-Robins. With plants at Buffalo and Passaic, Hewitt-Robins, a leading producer of foam rubber, is also one of the largest independent manufacturers of conveyor belting and machinery, hose and other industrial rubber products.

Mr. Robins disclosed that under the arrangement his company will purchase for cash all machinery in the Belfer foam rubber plant on Staten Island, presently used for the manufacture of foam rubber pillows and mattresses, and lease the buildings, including a pier, for a period of 13 years. Hewitt-Robins will take over the plant July 6. Located at Pier 23, 191 Edgewater Street, on Lower New York Bay, the Belfer plant has a manufacturing area of 136,000 square feet. The pier, with deep water berthing space, is 665 feet long.

With the deep water pier, Hewitt-Robins will be in a position to receive bulk liquid latex by ocean tankers for use at the Staten Island plant and for transshipment to its main foam rubber operation at Buffalo. The Buffalo foam rubber plant, in addition to operating those facilities at full capacity, is building substantial quantities of self-sealing gasoline tanks for the armed forces.

Mr. Robins said his firm's plans for expansion are based on a general easing in the over-all rubber supply. He said that with government stockpiling now in sight of its goal, and the synthetic rubber industry operating at virtually 100 percent capacity, rubber latex will soon be in ample supply, barring the spread of war.

The Staten Island plant will close down for a one-week employee vacation on June 30 and will reopen July 8 under the new ownership. Hewitt-Robins expects to continue in its employment all personnel currently on the Belfer payroll. Arthur Belfer, president of the Belfer Corporation, in a statement regarding the sale, said he planned to continue to devote all his time and the resources of his company to the rapidly expanding government demand for sleeping bags. The company is currently the largest manufacturer of sleeping bags for the armed forces.

Elections to I.R.I. Fellowship

At a recent meeting of the Council of the Institution of the Rubber Industry (England), T. A. Werkenthin, principal materials engineer, Rubber Branch, Bureau of Ships, U. S. Navy, and J. M. Buist, senior physicist, Rubber Service Dept., Imperial Chemical Industries, Ltd., were elected Fellows, and Fordyce Jones, who recently retired as chairman of the Reliance Rubber Co., Ltd., was elected an Honorary Fellow. All three electees have long been associated with rubber manufacturing activities and the elections were in recognition of their valuable contributions to the industry.

NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation, since publication of those in our previous issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue. Normally, experimental polymers will be produced only at the request of the consumers and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside if possible for distribution to other interested companies for their evaluation. The 20 bales when available will be distributed in quantities of one or two bales upon request to the Sales Division of Rubber Reserve or will be held for six months after the experimental polymer was produced unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received to warrant them.

X No.	*Polymer Description*
X-642 GR-S	Similar to GR-S-100 except polymerized at 48°F.
X-643 GR-S	Similar to GR-S-100 except polymerized at 48°F, and butadiene-styrene charge ratio adjusted to give 16.5 ± 1% bound styrene.
X-644 GR-S-AC	Similar to GR-S-30AC.
	Please Note Changes Made in the Following Experimental Polymers
X-547 GR-S Latex	Shortstopped with potassium dimethyl dithiocarbamate or dimethyl ammonium dimethyl dithiocarbamate.
X-600 GR-S	Mooney viscosity changed to read 40 ± 5 ML-4.
X-639 GR-S	Same as GR-S 26 with 20% bound styrene and shortstopped with sodium dimethyl dithiocarbamate and TEPA or Polyamine H.

NOTE: The above new polymers are experimental only and the Office of Rubber Reserve, Reconstruction Finance Corporation, does not make any representation or warranties of any kind, express or implied, as to the specifications or properties of such experimental polymers, or the results to be obtained from their use.

Ansul Blo Sponge Blowing Agent

"Ansul Blo," a new sponge rubber blowing agent, has been introduced by the Ansul Chemical Co., Marinette, Wisc. A bicarbonate type material, "Ansul Blo" has been chemically processed to resist water absorption (caking) and to flow freely under the most adverse conditions of storage and handling. Its uniform particle size provides fast, even dispersion throughout the rubber, improving quality and reducing rejects. Preliminary testing indicates that one part of the product is equal to two parts of sodium bicarbonate. In addition, "Ansul Blo" produces a complete, even blow. Leaching is held to a minimum and premature blow is eliminated with this new material. It is non-toxic, non-discoloring and odorless, the company states.

Hercules Adds Laboratory Wing

Hercules Powder Co. has announced the completion of a three-story addition to the main laboratory building at its Experimental Station near Wilmington, Del. The new wing is the major project in a series of expansions made during the past five years. The addition provides 26 new laboratory units accommodating 51 chemists and increases the research facilities of the main building by more than 60%. Construction of the expansion was started in November, 1949.

Dewey & Almy Sells Stock

An issue of 200,000 new shares of the Dewey & Almy Chemical Co., Cambridge, Mass., was placed on the market on May 28 by an underwriting group headed by Paine, Webber, Jackson & Curtis of New York. The stock was priced at $22.125 a share and subscription books were closed on the afternoon of the same day. From proceeds of the sale, the company will pay off $1,100,000 of 3½% notes, so that capitalization will consist of $3,986,000 of 2⅞% debentures due in 1976 and 913,898 shares of common stock. The stock offering was in accordance with a recapitalization plan adopted in March, and an estimate of outstanding common stock after this financing assumes the complete exchange of old stock under the capitalization set-up.

Buy William R. Thropp & Sons

William R. Thropp & Sons Co., Trenton, N. J., rubber machinery manufacturer, has been purchased for more than $1,000,000 by a group of Rochester, N. Y., industrialists headed by Harry Schwartz. The transaction was arranged through the Asset Realization Co. of Newark, N. J. The new owners plan to enlarge the business, according to Mr. Schwartz. He said similar operations in Rochester would be moved to Trenton and the 100,000 square foot Trenton plant will be expanded to provide additional space for equipment.

Mansfield Promotes Executives

James H. Hoffman

An expansion of executive personnel in line with the broadening operations of the Mansfield Tire & Rubber Co. at Mansfield, Ohio, was announced recently. The announcement followed a meeting of the board of directors at which G. W. Stephens was re-elected chairman of the board; H. B. Soulen, president, and J. S. Wainright, vice-president. In the expansion of the executive staff, James H. Hoffman was named executive vice-president of the company and E. E. Stevens was named vice-president in charge of sales. Mr. Hoffman had been secretary-treasurer of the company, while Mr. Stevens had been general sales manager. In other changes, E. P. Stephens, formerly assistant secretary, was named secretary, and Boyd Weaver, previously controller, was named treasurer. Mansfield Tire operations have been considerably expanded in the past year. The Inland Rubber Co. of Chicago has become a subsidiary of the Mansfield company and its operations have been extended to the West Coast under a contract by which it is providing certain managerial and technical services to the Pacific Tire & Rubber Co. of Oakland, Calif. The contract also provides for possible acquisition by Inland Rubber of a one-half interest in Pacific Tire. Earlier, the tire and tube production of the Pennsylvania Rubber Co. was consolidated with the company's production at Mansfield.

Wrisley Buys Werk Trade Names

Allen B. Wrisley Co., Chicago, Ill., has announced the purchase of the industrial soap trade names of the M. Werk Co., Cincinnati, Ohio. The Wrisley company will manufacture these industrial soaps in accordance with Werk standards and specifications. H. R. Schmidt, formerly sales manager for Werk, has been named Industrial Sales Manager for the Allen B. Wrisley Co., and will continue to serve the trade. The present distributors, dealers and agents will continue to handle the Werk line of soaps and the present sales force will remain intact. Wrisley assumed the manufacture and distribution of Werk industrial soaps on June 1.

More Names in the News

JAMES A. BRASWELL, who recently returned from India after serving for two years as chief chemist of the Bombay plant of the Firestone Tire & Rubber Co., has been named chief chemist of the company's plant at Des Moines, Iowa.

FREDERICK L. PATTON, vice-president of the Cambridge Rubber Co., has been elected president of the Boston Control of the Controllers Institute of America.

GEORGE L. INNES has been named assistant sales manager of the Jefferson Chemical Co., New York, N. Y. JOHN R. CARLSON has joined the sales department of the company.

LEONARD CONNOR, associated with the Bakelite Co., a division of Union Carbide and Carbon Co., since 1942, has been named retail sales promotion manager for the company.

THOMAS KERR, formerly Airfoam representative of the Goodyear Tire & Rubber Co. at Los Angeles, Calif., has been transferred to Akron where he will handle special accounts. DEAN E. OAKES, SR., associated with the company since 1945, has succeeded Mr. Kerr at Los Angeles.

Named Head of RCA and Eclat

R. T. Reiss has been elected president of both the Eclat Rubber Co. of Cuyahoga Falls, Ohio, and the R.C.A. Rubber Co. of Akron, Ohio. He succeeds his father, C. E. Reiss, as head of Eclat, and the late Jack E. Smith as president of R.C.A. Mr. Smith died several months ago. C. E. Reiss has been named chairman of the board of directors of the two companies. R. T. Reiss has been associated with the two concerns since 1941. He had been treasurer and a director of the two concerns since 1946. Other changes in officers included the election of F. W. Todd as vice-president of both firms and Evelyn Phelps as secretary of R.C.A. Miss Phelps is also secretary of Eclat Rubber. Directors of R.C.A. are C. E. and R. T. Reiss, Mr. Todd and J. E. Wilson. The board of Eclat Rubber now includes C. E. and R. T. Reiss, Mr. Todd, Miss Phelps and H. E. Stayner. R. R. Wernig is vice-president in charge of sales for both companies.

Buys Delaware Floor Products

Congoleum-Nairn, Inc., Kearny, N. J., has signed a purchase agreement to buy the assets, manufacturing rights and facilities of Delaware Floor Products, Inc., Wilmington, Del. The price was not disclosed. Congoleum-Nairn will continue operating the Wilmington plant and marketing its vinyl plastic flooring. It will also add some plastic products to its own brand line of floor and wall coverings. Delaware Floor Products will retain its corporate entity for the liquidation and distribution of remaining assets to its stockholders. Most Delaware officers and key employees will be retained.

Interchemical Promotes Mason

James N. Mason

James N. Mason, active for many years in the rubber industry, has been named executive vice-president of the Coated Products Division of the Interchemical Co., New York, N. Y. Mr. Mason is also serving as chairman of the unit's Defense Contract and Development Committee. Under Mr. Mason's direction, the latter has developed three new processes—rubber latex coating of fabrics, vinyl plastisol resin coating of fabrics, and vinyl and rubber latex saturation of fabrics. All are now in defense production at Interchemical's coating plants in Winthrop, Maine, and Buchanan, N. Y., with civilian and industrial applications being studied. The Buchanan plant is one of the largest coating plants in the country. Before joining Interchemical in 1949 as executive vice-president of its Standard Coated Products Division, Mr. Mason was associated for eight years with the O'Sullivan Rubber Corp., serving consecutively as superintendent, plant manager, vice-president and executive vice-president, and a director. During 1941-42, he was plant superintendent of the Victor Products Corp., Hagerstown, Md. He also served as plant manager of the Quabaug Rubber Co., North Brookfield, Mass., from 1931 to 1941.

General Tire Service Center

General Tire & Rubber Co. has opened a new Tire Service Research Center near the company's plant in Akron, Ohio. The new research organization is said to be the first of its kind in the nation, and is dedicated to devising new and improved methods of recapping and repairing tires for automobiles, trucks, farm, aviation and off-the-road equipment. It will also serve as the information center for General Tire's Kraft System, the first standardized service system in the United States. The center is staffed by top Kraft engineers and technicians. These technicians will coordinate work in the new laboratory with the developments and discoveries made by the company's main research organization. The new facilities will also be used as a training unit for tire men from all parts of the country.

RUBBER-STICHTING SPONSORS LATEX CONFERENCE IN SWEDEN

The Scandinavian Section of the International Rubber Office at Stockholm, Sweden, a branch of the Rubber-Stichting, Delft, Holland, sponsored a series of conferences on latex which were held in the capitals of the various Scandinavian countries from May 14 through 19. Representatives of Rubber-Stichting presented seven lectures at each of the conferences, dealing with the latest scientific developments in the field of latex technology.

The lectures were partly presented in the name of sister institutes of Rubber Stichting, including the Indonesian Rubber Research Institute, the British Rubber Development Board, and the Institut Francais du Caoutchouc. The meeting in Oslo, Norway, attracted 70 persons, while 55 persons attended the meeting in Copenhagen, Denmark and 80 were in attendance at the Stockholm meeting.

The entire series of meetings were known as "Latex Days," and were intended to show the differences between the "dry rubber" industry and the possibilities for making rubber articles directly from latex. It was stated at the conferences that the mechanical properties of latex products usually differ from those of dry rubber products. In this sense, latex is not competitive to dry rubber, but complements it.

It was also said that the founding of a latex industry is simpler than that of a dry rubber industry. Nowadays, it was said, many rubber products are made with the aid of plaster of Paris molds instead of metal molds. This enables a manufacturer to substantially reduce delivery time for rubber products. In general, it was said that the capital investment involved in the foundation of a latex industry is one-quarter to one-third the amount necessary for a dry rubber industry.

A great deal of attention was devoted to the manufacture of foam rubber, and casting with heat-sensitive latex. The manufacture of latex-ebonite articles was also discussed. Difficulties encountered in processing latex were also discussed as well as its advantages. It was also emphasized that the latex industry needs a great number of technicians.

Lt. Colonel C. Dahlgren, director of the International Rubber Office, Scandinavian Section, at Stockholm, delivered the opening address. Authors, and the papers they presented at the conferences, included the following:

Dr. Ir. R. Houwink, Director General, Rubber-Stichting—"Why Use Natural Latex", "The Properties of Latex-Ebonite Compared with those of Bakelite" and "Economic Aspects of Latex Applications."

Dr. G. M. Kraay, Rubber-Stichting—"The Constitution of Latex," "Types of Latex on the Market", "Thermosensitive Latex", "Reinforcing of Latex", and "Testing of Latex."

Ir. J. van Houweninge, Director, Development Department, Rubber-Stichting—"Flow Casting Process", "Making Ebonite, Starting With Latex", and "The Properties, Manufacture and Application of Latex Foam."

More Certificates of Necessity

In recent weeks, the Defense Production Administration has issued an additional number of Certificates of Necessity to industry which provide for accelerated tax amortization for defense facilities. Among the companies which have recently received these certificates are:

Goodyear Tire & Rubber Co., Los Angeles, Calif., $38,791 for earthmover tire repairs.

B. F. Goodrich Co., Akron, Ohio, $106,353 for a tire testing program.

Plastic Wire & Cable Corp., Jewett City, Conn., $125,000 for the production of wire.

Firestone Tire & Rubber Co., Memphis, Tenn., and Los Angeles, Calif., $1,909,050 for reclaimed rubber.

Midwest Rubber Reclaiming Co., West Coast, Calif., $1,400,900 for reclaimed rubber.

U. S. Rubber Co., Bristol, R. I., $108,864 for communications wire.

West Co., Phoenixville, Penna., $393,427 for medical closures.

Rubber-Latex Products, Inc., Cuyahoga Falls, Ohio, $60,000 for surgical tubing.

Goodyear Tire & Rubber Co., St. Marys, Ohio, $33,348 for gaskets.

Dewey & Almy Chemical Co., Cambridge, Mass., $404,000 for synthetic rubbers.

B. F. Goodrich Co., Akron, Ohio, $81,873 for fabrics for life rafts.

Precision Rubber Products Corp., Dayton, Ohio, $152,487 for "O" ring seals.

Polson Rubber Co., Garrettsville, Ohio, $144,459 for the reclaiming of rubber.

Acushnet Process Co., New Bedford, Mass., $389,436 for molded rubber parts.

Stanley Kogut (Mechanical Rubber Products Co.), Warwick, N. Y., $32,000 for moldings, gaskets (synthetic rubbers).

Aldan Rubber Co., Philadelphia, Penna., $200,356 for rubber-coated fabrics.

Oliver Tire & Rubber Co., Emeryville, Calif., $93,000 for rubber stoppers.

Oliver Tire & Rubber Co., Emeryville, Calif., $21,760, also for rubber stoppers.

G-E Triples Silicone Production

Facilities for the molding and extruding of Silicone Rubber parts have been transferred from the Chemical Department plant of the General Electric Co. at Pittsfield, Mass., to the Decatur, Ill. plant of the department. New equipment has been added to the Decatur plant that will enable production to be tripled. The centralizing of the Silicone Rubber fabricating operation will permit better service to the aircraft, automotive and electrical industries, the company stated. New extruders and molding presses will also facilitate the manufacture of larger size parts than have been formerly available from the company. Increased production facilities have been installed to handle the increasing number of applications in non-defense as well as defense jobs, it was stated. It is anticipated that large quantities of molded and extruded G-E Silicone Rubber parts will be used in the near future for hermetically-sealed electrical components, and on tanks for ignition and transmission systems. The aircraft industry will also require quantities for gaskets, ducts and cable.

SALES OF CARBON BLACK IN 1950 INCREASE 34% ABOVE 1949 TOTALS

According to the Bureau of Mines of the United States Department of the Interior, total sales of carbon black produced in the United States increased 34% to 1,508,639,000 pounds in 1950 from the 1,125,410,000 pounds sold in 1949. A total of 1,381,991,000 pounds was produced in 1950, 13% more than the 1,223,636 pounds produced in the previous year.

Production increased in all reporting districts and states except Oklahoma with largest increases taking place in Louisiana and "rest of Texas". Production of furnace blacks in 1950 increased 28% to 765,226,000 pounds from the 595,986,000 pounds produced in 1949. Production of channel blacks in 1950 totaled 616,765,000 pounds, a decline of 2% from the 627,650,000 pounds produced in the preceding year.

Sales in 1950 expanded more rapidly than production, the Bureau stated. Sales of furnace blacks increased 42% and sales of channel blacks increased 25% in 1950 over the previous year. Demand for furnace blacks was strengthened by the necessity for using increasing proportions of synthetic rubber.

All classes of consumers used increased quantities of carbon black in 1950. Consumption by rubber companies totaled 1,030,368,000 pounds, 263,237,000 pounds more than the 767,131,000 pounds consumed in 1949. Stocks of both channel and furnace blacks declined sharply during 1950. Channel black on hand as of December 31, 1950, totaled 65,342,000 pounds, while 24,202,000 pounds of furnace black were on hand. At the end of the preceding year, 119,599,000 pounds of channel and 96,862,000 pounds of furnace black were on hand.

The quantity of natural gas used in the production of carbon blacks decreased slightly to 410,852,000,000 cubic feet in 1950 from the 427,892,000,000 cubic feet used in 1949. The use of liquid hydrocarbons, however, increased by nearly 50% to 107,707,000 gallons, against 72,387,000 gallons in the previous year.

The value at plants of the total production of carbon black in 1950 was $84,604,000, compared with $74,685,000 in 1949. The average value per pound in 1950 was 6.12c per pound, against 6.10 in 1949. The number of plants operating during 1950 was 53 compared with 63 during 1949. Only one of the plants shut down was a furnace plant.

Spring-Type Blades and Plugs

Waldron Products, Detroit, Mich., is producing an electrical plug in which double spring-type blades assure contact even in worn receptables. Using either a rubber or plastic body, the plug blades are "bowed out" in both directions to insure connection, regardless of where contact is located in the receptacle. Flexibility of the blades also prevents the plug dropping out of the loose receptacles, but the plug does not pull out too hard in a tight receptacle. The plug is distributed through Laminated Metals Products Corp., 9993 Broadstreet, Detroit 4, Mich.

Nagy Named Vice-President

Louis Nagy

At a recent meeting of the board of directors of Parker, Stearns & Co., Brooklyn 27, N. Y., Louis Nagy, associated with the company since 1937, was elected a director of the corporation and promoted to vice-president in charge of research and development. Mr. Nagy attended the University of Akron and was graduated from Cornell University as a chemical engineer. After a period spent with the Goodyear Tire & Rubber Co. in the General Laboratories and with the Firestone Tire & Rubber Co. in the Compounding Department, he joined Parker-Stearns. Some time later he became chief chemist and pioneered in developing special applications for synthetic rubbers and in the field of vinyl plastics.

Review of Current Research

The Engineering College Research Council of the American Society for Engineering Education has announced that the 1951 edition of "Review of Current Research and Directory of Member Institutions" is now available for distribution. The new book outlines policies and activities of engineering research in 91 colleges and universities holding membership in E.C.R.C. and offers a guide to current research contributions of engineering schools. In addition to complete research project titles, the volume shows for each school the name of responsible research administrative officers, a brief digest of policies which govern research projects and contracts at each institution, the number of personnel engaged in research activities, the annual expenditures, and special conferences and short courses of interest to research workers. Copies of the book may be obtained from the Council at Room 7-204, 77 Massachusetts Ave., Cambridge 39, Mass., for $2.25 each.

New Laboratory for Faultless

Faultless Rubber Co. is constructing a $125,000 research and development laboratory in Ashland, Ohio. The new 65,000 square foot unit will be adjacent to the firm's main plant and is scheduled for completion by July. It will free a smaller amount of space in the plant for production and office purposes.

WASHINGTON APPOINTMENTS

Kenneth H. Klipstein, formerly deputy director of the Chemical Division of the National Production Authority, has been named director of the division succeeding Joseph H. Bates, who has resigned. Mr. Klipstein is on leave from his position as assistant general manager and head of the Technical Department of the Calco Chemical Division of the American Cyanamid Co. Mr. Bates is president of the Bates Chemical Co.

Francis J. Curtis, on leave as vice-president and a director of the Monsanto Chemical Co., has been named as an assistant administrator of the National Production Authority to head its Chemical, Rubber and Forest Products Bureau.

W. W. Watts, formerly assistant to the administrator of the Defense Production Administration, has been named deputy administrator in charge of all DPA production and procurement activities.

Charles E. Wampler, previously director of DPA studies on programming and requirements, has been named a deputy administrator in charge of those functions. Mr. Wampler has also been named chairman of the Requirements Committee, which determines requirements and allocations for military and civilian production.

Nathaniel Knowles has been named deputy administrator for staff service of the DPA succeeding Edwin T. Gibson who was named acting Administrator of DPA upon the resignation of W. H. Harrison, recently.

Gabriel J. Ticoulat, formerly director of the Pulp, Paper and Paper Board Division of the National Production Authority, has been named deputy assistant administrator of the Chemical, Rubber and Forest Products Bureau of NPA. Mr. Ticoulat is on leave of absence from his post as vice-president of the Crown Zellerbach Corp. of San Francisco, Calif.

General Tire Spanish Affiliate

General Tire & Rubber Co., Akron, Ohio, has acquired a major interest in the Continental Fabrica Espanola del Coucho, S. A., of Spain. The new General Tire affiliate is Spain's second largest rubber manufacturing company. It produces mechanical goods in addition to tires and tubes. General Tire now has 12 affiliated and subsidiary companies outside of the United States and is considering several others. While it ranks fifth in size among American rubber companies, General Tire is believed to be the third largest operator in the foreign market, being surpassed only by the Goodyear Tire & Rubber Co. and the Firestone Tire & Rubber Co. Goodyear and Firestone own outright most of their operations in other countries. General Tire and the B. F. Goodrich Company's policies have been to take a substantial minority interest in the foreign companies and in some cases to supply only technical service.

Mohawk Rubber Promotes Silver

Frank F. Silver

Frank F. Silver, associated with the Mohawk Rubber Co., Akron, Ohio, for the past eight months as a member of the Engineering Staff, has been named assistant factory manager of the Akron plant. Mr. Silver was formerly with the Goodyear Tire & Rubber Co., where he started in 1942. During 1943 and 1944, Mr. Silver was sent to Calcutta, India, by Goodyear. There, he was engaged in technical work for the Air Force at the Dunlop factory. During his last three and one-half years with the company he was in South Africa where he was in charge of technical service and tire design. A native of Iowa, Mr. Silver is a graduate in engineering of Iowa State College.

OTS Issues Report on Polymers

Accomplishments in the research fields of polymer science and engineering are reviewed in a special feature article in the May, 1951, issue of the *Bibliography of Technical Reports* just released by the Office of Technical Services of the U. S. Department of Commerce. Results of investigations, carried on by the Princeton University Plastics Laboratory, are reported under four categories: mechanical; electrical; new or improved materials; and high polymer. In each category are listed pertinent technical reports. The May, 1951, issue of the *Bibliography of Technical Reports* sells for 50 cents per copy, and may be purchased from the Office of Technical Services of the U. S. Department of Commerce, Washington 25, D. C. or through the U. S. Department of Commerce field offices. Orders should be accompanied by check or money order payable to the Treasurer of the United States.

Russian Journal Index Offered

An extensive index to the English translation of Volume 19 of the *Journal of General Chemistry of the U.S.S.R.* has been compiled and can be secured at a cost of $2.50 from the Consultants Bureau, 152 West 42nd St., New York 18, N. Y. The index is divided into four sections covering papers, authors, subject and organic compounds.

Trumbull Retires From Goodrich

Dr. Harlan L. Trumbull

Dr. Harlan Leo Trumbull, director of synthetic rubber and textile research, and assistant to the vice-president in charge of research for the B. F. Goodrich Co., retired from active duty on May 28 on his sixty-fifth birthday. Dr. Trumbull had spent 32 years with the company.

Born in Adair, Iowa, Dr. Trumbull received his bachelor and master degrees in chemistry at the University of Washington and his doctorate at the University of Chicago. During his senior year in college, he was chosen to serve as a temporary high school chemistry teacher in Juneau, Alaska. This set the stage for his early career as an instructor. For seven years he was assistant professor of chemistry at Washington University. While on sabbatical leave from the University in 1917, attending the Mellon Institute in Pittsburgh, Penna., Dr. Trumbull enlisted in the United States Army. As Captain Trumbull he helped establish the Chemical Warfare Service at the Edgewood, Md., arsenal.

Dr. Trumbull joined Goodrich on April 1, 1919. He spent his first six months with the company at the University of Chicago where Goodrich rented laboratory space. At that time it was impractical to ship liquid latex from the Far East for it would coagulate in transit. Dr. Trumbull's first big assignment was to make latex out of rubber, reversing what already had been accomplished. His idea was patented, and this was the start of a notable career. As manager of the company's chemical research laboratories, Dr. Trumbull supervised many of the outstanding developments in rubber of the past few years.

In 1947, the American Chemical Society designated Dr. Trumbull and his longtime associate Dr. Waldo L. Semon, as among the ten "ablest chemists and chemical engineers" working in the American rubber industry. A year before, the Linnean Society of Sweden, a botanist organization, invited him to join the group in tribute to his work in the field of American-grown rubber.

During the critical rubber emergency during World War II, he carried on many major government assignments.

LABOR NOTES

Contract and wage negotiations between the United Rubber Workers of America, C.I.O., and the U. S. Rubber Co., were scheduled to begin in New York City on June 7. The union was to have asked for a "substantial increase" in wages and a full union shop from the company.

A master contract, calling for a full union shop agreement, has been signed by the General Tire & Rubber Co. and the URWA. The contract will cover 2,600 employees in the Akron and Waco, Texas, plants of the company. Before the agreement goes into effect, however, an election must be held in the two plants.

New Milford Rubber Co., Inc., and the Approved Equipment Co., Inc., both of New Milford, N. J., have agreed to cease and desist from discouraging employee membership in the URWA. The announcement by the National Labor Relations Board resulted from a complaint filed by the union which stated that the firms had fired 20 employees because of union activity.

Grand Jury Indicts Roller Firms

Seven corporations and six individuals were indicted by a Federal grand jury in New York, N. Y., on May 24, for conspiracy to fix prices in Eastern United States for the manufacture and sale of printers' rollers in violation of the Sherman Anti-Trust Act. The defendants are the National Association of Printers' Roller Manufacturers, Inc., of Boston, Mass., and six member concerns and the presidents of each. The firms are: Sam'l Bingham's Son Manufacturing Co. of Chicago, Ill.; Bingham Bros. Co., New York, N. Y.; Godfrey Roller Co., Philadelphia, Penna.; Harrigan Roller Co., Inc., Baltimore, Md.; National Roller Co., New York, N. Y., and Wild & Stevens, Inc., Boston, Mass. The indictment charged that the conspiracy began July 1, 1947, and continued until May 24, 1951. The defendants were charged with a continuing agreement to fix and maintain "identical list prices to be charged for the manufacture and sale of rollers" and "to fix and adhere to uniform and non-competitive discounts from list prices granted in the Eastern territory." A civil injunction complaint against the association and the companies, but not the individuals, was filed at the same time.

Celogen Blowing Agent

Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn., has announced the development of "Celogen", a new blowing agent for natural or synthetic rubbers, plastics and plastisols. Celogen is said to be non-toxic, non-discoloring, non-staining and odorless. It may be used alone or as an auxiliary with sodium bicarbonate. Celogen is especially recommended for the continuous cure of fine sheet sponge, low cellular expanded plastics for insulation, upholstery materials, sponge soling, etc.

Naugatuck Chemical Promotes Crater

Willard deCamp Crater

Appointment of Willard deCamp Crater as assistant sales manager of Marvinol vinyl resins for the Naugatuck Chemical Division of the U. S. Rubber Co. at Naugatuck, Conn., was recently announced by the company. In his new capacity, Mr. Crater will develop new markets for vinyl resins and direct sales activities. He will make his headquarters in the Naugatuck plant. Mr. Crater joined Naugatuck in December, 1949, after wide experience in plastic research and manufacturing with the Hercules Powder Co., Federal Telephone and Radio Corp., and the Glenn L. Martin Co. He holds numerous patents on plastics used in the wire and cable industry and other fields. Mr. Crater is a member of the New York and Washington Rubber Groups and past-president of the Baltimore-Washington section of the Society of Plastics Engineers.

ECA Sponsoring Foreign Visitors

Between 200 and 250 young European and Southeast Asian chemists and chemical engineers will attend the World Chemical Conclave in September at the invitation of the American Chemical Society and under sponsorship of the Economic Cooperation Administration. A similar opportunity for 60 young chemists from non-ECA participating countries in Asia, Africa, South America and Europe, and from Australia and New Zealand is being provided through a grant by the Ford Foundation. The World Chemical Conclave will include the Diamond Jubilee celebration of the American Chemical Society, the 10th Conference of the International Union of Pure and Applied Chemistry and the 12th International Congress of Pure and Applied Chemistry. After attending the professional sessions of the international meeting, the chemists will spend two or three weeks in visits to government, university and industry chemical laboratories, plants and other installations in the United States. These visits are being arranged by the ACS under ECA sponsorship so the foreign chemists may observe at first hand the scientific, industrial and educational advances which have been made in the United States.

U. S. Rubber Defense Orders

The Mechanical Goods Division of the U. S. Rubber Co. has announced that it has received orders totalling more than $30,000,000 for the manufacture of self-sealing fuel cells for B-29 and B-47 bombers and rubber tracks for tanks and other tracked Army vehicles. Both products will be produced in the division's Fort Wayne, Ind., plant where more than 350 different rubber parts for automobiles are now being manufactured. The defense work will be in addition to the automotive work.

Fuel cells for B-29's and B-47's are already in production. Experimental tank tracks have been made and large-scale production was scheduled to begin in May. The division has also leased a factory at Decatur, Ind., which is used, at the present time, for the storage of defense production materials.

Special equipment consisting of new presses and a huge vulcanizer has been installed at Fort Wayne to handle the additional production. The vulcanizer, which is 45 feet long and 15 feet high, is one of the largest in the rubber industry today. Its installation was necessary to handle the huge fuel cells of the B-47. Two types of tank tracks will be produced initially at Fort Wayne. These will be used on medium tanks, gun motor carriages, howitzer carriages, high speed tractors and for the rehabilitation of World War II mobile equipment.

Other defense products now in production at Fort Wayne include aircraft motor mountings, motor mountings for jeeps, tank skirts, ammunition rack assemblies, mountings for electronic equipment, bushings for combat trucks, impeller gears for water pumps on landing craft, and hundreds of other rubber-to-metal specialties.

Mold-Ease Concentrate PCR

Merix Chemical Co., Chicago, Ill., has announced the production of "Mold-Ease Concentrate PCR," a water-miscible cast and mold releasing agent. The product is sprayed or wiped onto casts or molds, and quick release is said to be assured when the mold is opened or the item ejected. Aside from its prime use in the plastics field with phenolic, polyester and other common casting resins, Mold-Ease also finds use on natural and synthetic rubber as well as with metals and ceramics. The diluting ratio for rubber is usually 1 to 7 parts water, while for plastics the ratio is 1 to 10.

Ace Rubber Reorganizes Sales

Ace Rubber Products, Inc., Akron, Ohio, has announced the complete reorganization of the sales structure of the company. Prior to April 21, 1951, all Ace Rubber Products were sold through the "manufacturer's representative" plan. This has been abolished and Ace Rubber is now selling through its own organization of field salesmen. Coincident with the change, William J. Morrell, formerly associated with the American Hard Rubber Co., has been appointed sales manager for Ace Rubber.

Personnel of the Rubber Division, Chemicals, Rubber and Forest Products Bureau, National Production Authority (As of May 2, 1951)

Name	*Title*
	OFFICE OF DIRECTOR
Leland E. Spencer	Director
E. D. Kelly	Deputy Director
Edwin A. Harris	Special Assistant
Justin Feldman	Attorney-Advisor
Eloise LaRash	Secretary to Director
Margaret J. Dorr	Secretary to Deputy Director
Sarah Jo Jenkins	Secretary to Special Assistant
Everett G. Holt	Assistant to Director on Inter-Government Agency Liaison
Edward J. Webster, Jr.	Chief, Adjustment Staff
Geraldine B. Kidston	Administrative Officer
Margaret E. Kelly	Supervisor, Mail and File
	MATERIAL CONSERVATION BRANCH
Aden R. Miller	Acting Chief
George Allison	Deputy Chief
Ward Fisher	Chief, Tire & Tube Section
Leonard R. Ervin	Chief, Industrial Rubber Goods Section
Robert C. Dabney	Chief, Footwear Soles & Heels Section; Also Chief, Drug & Sundries Section
Harry M. Frecker	Technical Consultant, Industrial Rubber Goods
Richard E. Harmon	Technical Consultant, Synthetic Polymers
Arthur Nolan	Technical Consultant, Natural Rubber Latex
	MATERIAL REQUIREMENT AND PRODUCTION BRANCH
Aden R. Miller	Chief
F. R. Mathews	Deputy Chief
Paul C. McPherson	Chief, Tire & Tube Section
E. Daniel Wooldridge	Chief, Camelback & Repair Material Section
R. S. Breiner	Asst. Chief, Camelback & Repair Material Section
R. S. Wharton	Chief, Industrial Rubber Goods Section
Sydney Lamden	Consultant, Industrial Rubber Goods Section
Albert H. Wechsler	Chief, Footwear Section
Western Wiles	Chief, Drug & Sundries Section
William P. Harty	Chief, Soles & Heels Section
H. M. Dannenbaum	Chief, Proofed Goods Section
Grover W. Brown	Chief, Wire & Cable Section
Andrew B. Paddock	Staff Member, Wire & Cable Section
Harry D. Stewart	Staff Member, DO Review & Allocations
Isabel A. Knapp	Staff Member, DO Review & Allocations
	MATERIALS ALLOCATION BRANCH
Carl L. Buehl	Chief
Robert Lees	Technical Consultant, Natural Rubber Latex
George A. Biddle	Staff Member, GR-S Section; also N & S Types Section
George W. Scott	Staff Member, GR-S Section
Thomas J. Curley	Staff Member, Natural Latex & Butyl Section
Herman Slomin	Staff Member, Natural Rubber Section
	MATERIAL CONSUMPTION AND INVENTORIES BRANCH
Herbert N. James	Chief
W. Earl Wade	Chief, Rubber Usage Section
Saul E. Drimmer	Chief, Industry Report Processing & Statistical Processing Section
	MACHINERY AND EQUIPMENT BRANCH
Harry D. Brown	Acting Chief
Lester J. Waldron	Asst. Chief, Capacities Section
John W. Hamilton	Asst. Chief, Priorities Section
S. Earle Overlay	Chief, Amortization Section
	COMPONENTS LIAISON BRANCH
Harry W. Brown	Chief
John M. Ball	Chief, Reclaim Section
Arthur L. Foulger, Jr.	Asst. Chief, CMP Section

FINANCIAL NEWS

B. F. Goodrich Co.

First quarter: Net income of $8,058,128, which is equal to $1.90 a common share, compared with $5,332,445, or $1.23 a share in the first quarter of 1950 after reflecting a three-for-one stock split on January 10, 1951. Consolidated net sales in the first three months of 1951 climbed 51.3% to $157,728,418 from the $104,264,454 volume for the first three months of 1950. The income for the 1951 period is after provision for all expenses, including taxes, depreciation, and a $1,000,000 reserve for increased replacement cost of facilities. A similar reserve was provided in the 1950 period.

Boston Woven Hose & Rubber Co.

Six Months Ended February 28: Net income of $754,347, which is equal to $8.57 a share, compared with $139,712 or $1.38 a share, in the first six months of the previous fiscal year. In the six months ended February 28, 1951, net sales amounted to $11,154,411, against $5,845,120 in the six months ended February 28, 1950. At the end of the 1951 period, total current assets were $8,552,287 and total current liabilities were $3,140,154, contrasted with $5,957,390 and $1,257,793, respectively, at the end of the 1950 period.

Lee Rubber & Tire Corp.

Six Months to April 30: Net profit of $1,127,961, which is equal to $4.45 a capital share, compared with $816,361, or $3.22 a share, for the six months ended April 30, 1950. Net sales in the first half of the 1951 fiscal year amounted to $25,978,523, against $13,918,559 in the comparable 1950 period.

Minnesota Mining & Mfg. Co.

First Quarter: Net profit of $4,322,478, which is equal to 53c a common share on sales of $44,358,553, compared with $4,379,065, or 54c a share on sales of $32,241,932 a year ago. Outstanding shares were adjusted for the four-for-one stock split last January, and include 65,430 additional common shares above the total outstanding on March 31, 1950.

Rome Cable Corp.

Year Ended March 31: Net income of $1,922,136, which is equal to $4.56 a share, compared with $302,209, or 61c a share, reported for the previous fiscal year. Net sales for the fiscal year ended March 31, 1951 totaled $35,142,901, against the $19,602,984 recorded in the previous year.

Servus Rubber Co.

Year Ended February 28: Net income of $156,262, which is equal to 41c a common share, compared with $28,327, or 7c a share, in the preceding fiscal year.

Lee Rubber & Tire Corp.

Year Ended October 31: Net income of $2,944,732, which is equal to $11.61 a share on net sales of $39,267,254, compared with $1,211,499, or $4.78 a share on sales of $31,947,034 in the previous fiscal year. These figures reflect a revision of the original report, and include $210,000 for excess profits tax.

Columbian Carbon Co.

First Quarter: Consolidated net income of $1,612,277, which is equal to $1 a share, compared with $1,443,566, or 90c a share, in the first quarter of the preceding year. The 1951 income was increased by a retroactive price settlement for gas amounting to $354,922 before taxes.

Hewitt-Robins, Inc.

First Quarter: Net income of $282,163, which is equal to $1.01 a share, compared with $127,875, or 46c a share, in the first quarter of the preceding year. Net sales for the first quarter of 1951 totaled $8,395,119, against $4,460,713 in the first quarter of 1950.

DeVilbiss Company

First Quarter: Net profit of $207,860, which is equal to 69c a share, compared with a net profit of $78,142 in the first quarter of the preceding year.

New Jersey Zinc Co.

First Quarter: Net profit of $2,571,243, which is equal to $1.31 a share, compared with $297,547, or 15c a share, in the first quarter of the previous year.

United Carbon Co.

First Quarter: Net income of $922,817, which is equal to $1.16 a share, against $825,826, or $1.04 a share, in the first quarter of the preceding year.

Ore Belt Conveyor Studied

The United States Department of Defense is reported to be studying the proposed conveyor belt line linking the Ohio River and Lake Erie, as well as another project in Michigan which would provide a belt line as an alternate route to the bomb-vulnerable Soo Locks and the St. Mary's River. Both plans have been advanced by the Riverlake Belt Conveyor Lines, Inc. The Ohio State Senate has been considering the Ohio conveyor belt line with major opposition from railroad companies who see in the system elements of unfair competition. Both the Michigan and the Ohio conveyors are now being studied by Defense Transportation Administrator James K. Knudsen. Any decision will be governed by strategic considerations, it was said.

Maxwell Named Plant Manager

C. H. Maxwell

C. H. Maxwell, for the past three years production superintendent of Airfoam operations at Plant 3 of the Goodyear Tire & Rubber Co. at Akron, Ohio, has been named plant manager of the General Products Division, Plant C, in Akron, where most of the company's Airfoam and Pliofilm are produced. Mr. Maxwell succeeds H. R. Child, who was recently returned to a post he held during World War II as plant manager of the Hoosier Unit of Indiana Arsenal at Charlestown, Ind. The arsenal, as during the war, will be operated by the Goodyear Engineering Corp. Mr. Maxwell has been with Goodyear since 1927. In 1930, he was transferred to the company's Australian operations as a division superintendent, returning in 1946 to become development manager of chemical products. He moved to Airfoam in 1947. Mr. Maxwell is a graduate of Earlham College in Indiana and was an assistant professor there before coming to Goodyear.

Fanning to Produce Lanolin

Frank G. Fanning, of the company of the same name, has announced the completion of a plant at 352 Doremus Ave., Newark, N. J., for the production of lanolin, its derivatives and chemical specialties. According to Mr. Fanning, the plant is now in production, and has a rated capacity of approximately 500,000 pounds monthly. The plant is located on a railroad siding, and consists of two buildings of over 14,500 square feet with additional outside storage facilities of over 10,000 square feet. Mr. Fanning founded his company in 1946, after over 26 years experience in the lanolin field.

Baker Names St. Louis Agent

Baker Castor Oil Co., New York, N. Y., has announced that its sales in St. Louis, Mo., and immediate vicinity, are now being handled exclusively by Harry A. Baumstark & Co. of that city. To assure prompt deliveries in this important territory, a complete stock of Baker products will be warehoused at St. Louis by the new sales agents. The appointment was effective as of June 1.

CANADIAN NEWS

Five workmen were injured in an explosion which rocked the "C" unit of the Polymer Corp. plant at Sarnia, Ont., on May 6. The explosion and resultant fire destroyed about 1,000 square feet of the plant in an area used for the extraction of butadiene. Firefighting brigades brought the flames under control before seven other large storage tanks in the area were touched. H. R. Rowzee, plant manager, expected that normal plant operations would be resumed in three weeks. No definite reasons for the blast have as yet been advanced.

Canada's 23 locals of the United Rubber Workers, CIO, are going to press demands for immediate wage boosts of 25c an hour. A program calling for the wage increases was adopted by the Canadian section of the URW international policy committee in a recent meeting in Toronto. The policy committee section represents about 10,000 workers in Ontario and Quebec. Norman Allison, director of District 6 of the URW, and Desmond Walker, international secretary-treasurer, said the demand was drafted under authority of the union's economic program adopted by the entire policy committee in Detroit, Mich., on May 1. The wage rises are justified, Mr. Allison said, on the basis of "increased living costs, fabulous and unprecedented profits of the rubber and allied industries, and the increase in man-hour productivity."

Canadian Minnesota Mining & Manufacturing Co., Ltd., Canadian subsidiary of the St. Paul, Minn., company, is building a $2,000,000 plant in London, Ont. The new factory initially will employ about 400 workers to make all types of industrial and domestic sandpaper abrasives and adhesives.

Behr-Manning (Canada) Ltd., has been formed at Brantford, Ont., as a subsidiary of the Behr-Manning Corp., Troy, N. Y. The Canadian concern has taken over the plant and all abrasive manufacturing facilities of Canadian Durex Abrasives, Ltd. In announcing the subsidiary's formation, Behr-Manning said the step is in line with its current world-wide expansion program.

Porthouse Heads Pyramid Rubber

C. R. Porthouse, for many years vice-president and factory manager of the Pyramid Rubber Co., Ravenna, Ohio, was recently elected president of the company, succeeding R. W. Askanase who became chairman of the board. Other officers of the company include A. J. Farfel, vice-president, and J. B. Barrett, secretary-treasurer.

Sam Tour & Co., Inc., 44 Trinity Place, New York 6, N. Y., has published a new brochure, "All Under One Roof," which portrays the work of scientists, engineers, consultants and laboratories at the company.

Weyend Retires From Firestone

A. L. Weyend

A. L. Weyend, manager of Plant 2 of the Firestone Tire & Rubber Co. at Akron, Ohio, since 1939, retired on April 30 upon completion of 40 years of service with the company. More than 300 of his Firestone colleagues honored him with a banquet held on April 30 at Young's Hotel in Akron. Mr. Weyend's story is one of the success stories in the growth of the rubber industry. Born in Buffalo, N. Y., in 1883, he came to Akron in 1911 to become a day worker on treads at Firestone. He soon became a supervisor, then foreman, night superintendent, department manager and finally production superintendent at Plant 1. In 1939 he went to Plant 2 as plant manager. During 1929 and 1930, Mr. Weyend was assigned temporarily as plant manager of the Firestone plant at Brentwood, England.

Increases Resorcinol Production

Koppers Co., Pittsburgh 19, Penna., has announced plans to increase its production of resorcinol. The company has started improvements and additions to its Petrolia, Penna., plant which will increase its output of resorcinol from 4,500,000 to 6,000,000 pounds annually. The National Production Authority has granted Koppers a Certificate of Necessity to expedite the expansion. Every effort is being made to get the added facilities at Petrolia into production by November, 1951, company officials stated. Benzene is the primary raw material used in the making of resorcinol. The Petrolia plant was the first resorcinol plant to be started in this country and is still the largest. Koppers not only manufactures resorcinol but makes resorcinol adhesives at the plant. Resorcinol is now under government allocation and the entire production of the expanded plant will, for the present, be subject to distribution by NPA.

The Defense Production Administration has made available a 31-page guidebook designed to help the small manufacturer during the defense mobilization period. Entitled "Mobilization Guide for Small Business," the book is available from all Department of Commerce Field Offices.

LOS ANGELES NEWS

The June 5th meeting of the Los Angeles Rubber Group, held at the Mayfair Hotel in Los Angeles, Calif., was addressed by Douglas Chalmers, president and general manager of the Golden State Rubber and Latex Corp., Los Angeles, Calif. Mr. Chalmers spoke on "Optical Strain Analysis of Rubber Products". A review of Mr. Chalmers' paper will appear in the July issue of RUBBER AGE. The general session of the meeting featured an address by Don L. Davis, president of the Gadget-of-the-Month Club.

A group of local rubber men have formed a new company to be known as the Rubberette Co. The firm was to have been in operation by June 1.

United Rubber Corp., 823 Traction Ave., Los Angeles 13, has announced plans for the expansion of operations. While complete details have not as yet been revealed, the company has purchased a tract of land in Torrance, Calif., for the expansion.

Willard Voit, president of the W. J. Voit Rubber Corp., has been named to the Rubber Industry Advisory Committee of the National Production Authority.

Barksdale Valves, manufacturers of extreme pressure "Shear-Seal" Valves, have recently moved to their own plant at 1566 East Slauson Avenue, Los Angeles. L. S. Barksdale, president, has just announced his resignation as vice-president of the W. R. Whittiker Co., and general manager of the Saval Division, and will now devote his full time to Barksdale Valves. M. C. Nelson has been promoted from chief engineer to general manager.

In addition to expanded production and more efficient management, customer service should be further improved by a division of sales territories into four major areas—Western, Southern, Great Lakes, and New England—with a regional sales manager heading each section.

Enters Dry Colorants Field

Mid-America Plastics, Inc., Cleveland, Ohio, has purchased the rights and formulas of the Dry Color Division of the H. Jamison Co., New York, N. Y. Henceforth, the dry coloring operation will be under the jurisdiction of Mid-America Plastics. An entire floor of the Cleveland plant has been completely remodeled and modernized to incorporate facilities for the manufacture of dry colorants for crystal styrene and other thermoplastics. The trade name of the dry coloring produced by the company is known as "Colorblende." It is available in seventeen colors. Crystal styrene dry colored with "Colorblende" can be molded satisfactorily in molds having pin-point or restricted gating. The nozzle on the molding machine should be a mixer type with an opening of not over 1/8-inch. The Color Division of Mid-America Plastics is associated with Moslo Enterprises and the Moslo Machinery Co.

OBITUARIES

David C. Scott

David C. Scott, president of Scott Testers, Inc., of Providence, R. I., and internationally known authority in the field of physical testing, died in Providence on May 12. He was 66 years old. One of the early members of the American Society for Testing Materials in 1914, he had devoted life-long study to the testing of rubber,

textiles, wire and other materials, and had given many papers before meetings of technical groups and had published articles of a professional nature.

He held numerous basic and minor patents related to testing, and he was credited with major improvements in the science of physical testing over four decades. During World War I he had served as technical adviser to the Army Air Corps. Among personal honors was membership in the Textile Institute of Manchester, England, and the Textile Research Institute in this country.

Mr. Scott had been an officer of Scott Testers, Inc., and its predecessor company, Henry L. Scott Co., since 1900 and its president since 1936. Many of the tests developed by the company are standard, as are the machines produced to make such tests. Mr. Scott saw the business expand to the point where its equipment is in general use in industrial, foundation, college, and government laboratories here and abroad.

In addition to membership in several branches of the American Society for Testing Materials, he had been a member of the American Chemical Society since 1918 and a charter member of its 25-Year Club. On the board of directors of the A. C. S. Rubber Division, he was the New England representative. He was a pioneer member of the Society for Experimental Stress Analysis and had been a member of the American Society of Mechanical Engineers. He held membership as well in the American Association of Textile Colorists and Chemists.

His interest in yachting as a younger man was recognized by his election in the '20's as commodore of the R. I. Yacht Club, and he was a member of the Afterguard of the Intercollegiate Yacht Racing Association of North America. In activity on behalf of conservation, he was associated with various wild life and sportsmen's groups.

Mr. Scott is survived by his wife, a daughter, and two sons who have in recent years been in charge of the management of Scott Testers, Inc., James M. Scott, treasurer, and David C. Scott, Jr., secretary.

Robert J. Lindquist

Robert J. Lindquist, financial vice-president of the Standard Oil Co. of Indiana since 1945, died on May 5 in Chicago, Ill. He was 48 years old. Mr. Lindquist was formerly chief auditor of the Reconstruction Finance Corporation in Washington, D. C., and a director of both the Defense Plant Corporation and the Rubber Reserve Company. He was a vice-president and a director of the Reynolds Metals Co. and subsidiaries from 1941 to 1943. Later, he was a vice-president, controller and a director of the Curtiss-Wright Corp.

Hans Volpp

Hans Volpp, vice-president and production manager of E. F. Drew & Co., died of a heart attack on May 25 at Mountainside Hospital in Montclair, N. J. He was 52 years old.

National Seal Co. Expands

Ground has been broken for construction of an addition to the plant of the National Seal Co. in Van Wert, Ohio. The addition will add 40,000 square feet to the plant. National Seal is a subsidiary of the National Motor Bearing Co. Also scheduled for the Van Wert plant is a rubber compounding building which will have an area of 4,000 square feet. A second floor will be added to the present office building which will add another 5,000 square feet. National Seal will soon begin production of a new type "face" seal needed in large volume for military equipment and for farm machinery, washing machines and many other types of machinery. The new building at Van Wert will also house manufacturing of National Motor Bearing's patented "Airtron" ducting, heretofore made exclusively by the Arrowhead Rubber Co., another subsidiary, at Downey, Calif. "Airtron," made of glass fabric impregnated with synthetic rubber, has largely replaced metal ducting on aircraft and is now being adapted to applications on trucks, tanks and other automotive equipment. Cost of the new building and equipment is estimated at approximately $500,000. Building is scheduled for completion by November 1.

Reports on MCA Research Program

Promise of a new fast method for control of cure of plastics in commercial molding operations and the discovery that molecular reorientation will increase tensile strength of polystyrene three-fold are among the year's results reported recently to sponsors of a fundamental research program on plastics being carried out at Massachusetts Institute of Technology. The sponsors, all members of the Manufacturing Chemists' Association, have been cooperating with M.I.T. through an M.C.A. Plastics Technical Subcommittee to give advice and steer the project during its six years of operation. At M.I.T., the work is under the direction of Professor A. G. H. Dietz. Earlier significant results from the research have included development of new machines and techniques for testing plastics, methods of casting thin films for determination of mechanical properties, and demonstration of the utility of the turbidimeter for measuring molecular weight distribution of thermoplastic polymers. Principal objective of the program is to fill gaps in existing data and provide the material necessary for development of theories on the fundamental behavior of plastics under mechanical stress.

DuPont Opens Research Addition

E. I. du Pont de Nemours & Co., Inc., opened its new $30,000,000 addition to the Experimental Station in Wilmington, Del., on May 10. The recently completed expansion makes the station one of the largest research establishments in American industry, housing one-half of the company's research personnel. Research men from nearly every section of the nation were taken on an inspection tour of the new laboratories preceding a dinner in the Hotel DuPont. The speakers at the dinner were Dr. James B. Conant, president of Harvard University, and Crawford H. Greenwalt, president of the company. The station now employs about 800 technically trained research workers representing a wide range of sciences. In addition, it has approximately 1,500 non-technical employees. The technical employees include graduates of more than 200 colleges and universities, and 575 of these hold advanced degrees.

Piccolyte Shipments Disrupted

Because a disastrous fire and explosion has destroyed the manufacturing facilities of its supplier of beta pinene, the Pennsylvania Industrial Chemical Corp., Clairton, Penna., has halted all shipments of Piccolyte Resins effective May 29. Beta pinene is the starting raw material for the resin. Pennsylvania Industrial said that, unfortunately, there are no supplies of raw materials in storage. The company has established a small emergency stock of Piccolyte Resins which it will use to supply DO rated orders, where no substitute material can be used. The company has also isolated equipment at its Chester plant for interim emergency processing of turpentine, and shipments on a smaller scale should be possible late in June. The company will advise its customers when they can expect a resumption of shipments.

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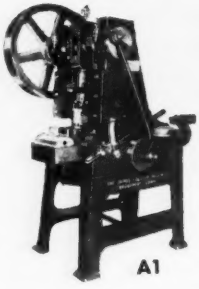
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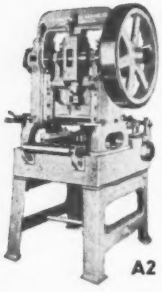
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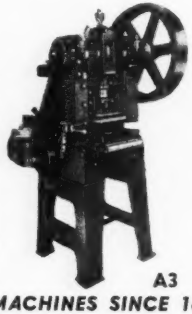
MODEL A-2
Cutting Multiple Heels, Half and Full Soles with stock grain.

MODEL A-3
Cutting Multiple Heels and Taps with or across stock grain.

MODEL A-2s
(Not illustrated)
Cutting across grain of stock.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COULTER PRODUCTION MACHINES SINCE 1896

NEW EQUIPMENT

New Type Beta Ray Gauge

The Industrial Nucleonics Corporation, 1205 Chesapeake Avenue, Columbus, Ohio, announces the availability of a new Beta Ray Gauge for continuously recording variations in weight per unit area or thickness of a wide variety of moving sheet materials directly on the production line. Steel, aluminum, brass, rubber, plastics,

and coated textile manufacturers are a few examples of those who can profit by the use of such a gauge. The outstanding advantages of this Beta Ray Gauge are its ability to measure accurately and continuously to a few millionths of an inch without contacting the material being gauged, its ability to operate continuously without any standardization or recalibration by plant personnel, its insensitivity to steel composition changes, and its high degree of stability under adverse plant conditions including temperature variations, dirt, moisture, shock, and vibration.

This gauge utilizes radioactive materials produced under the direction of the U. S. Atomic Energy Commission at the Oak Ridge Atomic Pile. The basic components of the gauge are a source of beta radiation, a radiation detector, and a recording device. The material being measured is run through a gap between the source and detector, preventing a portion of the source radiation from reaching the detector in proportion to the weight per unit area of the material. Readings directly in terms of thickness can be made on materials of constant density. Gauge readings are unaffected by variations in chemical or physical characteristics of the product being measured. The Industrial Nucleonics Beta Ray Gauge has been designed for rugged industrial use and the electronic circuitry as well as the gauging head and console will operate under the most severe plant conditions.

The U-shaped mount on which is secured the source box and radiation detector-amplifier unit is fabricated from heavy, welded H-beams. The amplifier circuit does not utilize delicate, easily damaged subminiature electrometer tubes and heavy blows on the detector-amplifier unit will cause no inaccuracies in the gauge reading. The hermetically sealed beta radiation source capsule is protected by a ¼-inch thick welded steel housing and is provided with an electrically operated shutter mech-

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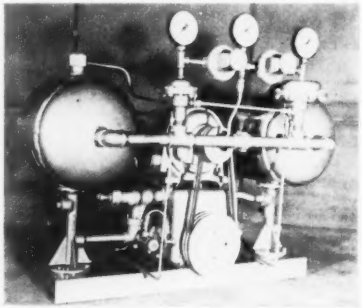
anism to assure complete safety for operating personnel. The floor mounted console is constructed of 14 gauge steel and houses a Bristol Dynamaster electronic strip chart recorder, three highly regulated AC power supplies, reference batteries, and automatic standardizing control mechanism.

Operation is extremely simple and consists of merely changing settings on two dials recessed in the console whenever manufacturing thickness specifications are changed. These dial settings are made with a calibration chart supplied with each gauge. No other adjustments are ever required since causes of errors are eliminated periodically by automatic standardization without attention by the operator. This is said to be the only Beta Ray Gauge available which standardizes automatically for all causes of drift or erroneous readings. A scanning mechanism can be used with the gauge to permit readings across the widths of a sheet. Scanning can be carried out continuously or intermittently and the detector unit can be set to remain in a stationary position at any point along the scanning width.

Hydraulic Press Power Source

Simplicity of design and flexibility of control are features of the Rialto Model 200 Power Source, manufactured by the Oracle Engineering & Sales Corp., Tucson, Arizona, for hydraulic molding presses. Heart of the pumping unit is a unique bypass sleeve, actuated in and out of pumping position by a snap action regulator con-

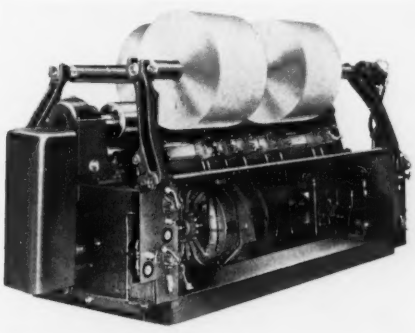


trol valve. Two separate pumping sections develop individual pressures providing for low pressure rapid advance volume and high pressure liquid for "dwell time." By regulating air pilots both low and high pressure may be individually selected, providing line pressures from 0 to 6000 psi, and permitting the use of a simple operating valve for press control. Model 200 is available in six sizes and pumps water, oil or other mediums without generating heat. The unit is said to operate wherever ventilation is sufficient for an electric motor.

General Electric Co., Schenectady, N.Y., has introduced a new **short-stroke solenoid** for heavy-duty industrial applications. It features a cast-permafil coil assembly and tests indicate it will operate millions of times before failure. It is said to be ideal for any application requiring a push-type solenoid with a maximum stroke that does not exceed 5/16ths of an inch.

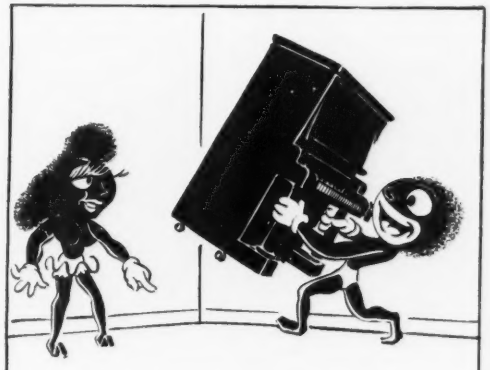
B & S No. 15 Duplex Rewinder

Simplicity of design, variable speed drive up to 1500 feet per minute, compactness, and vibrationless operation are among the features of the No. 15 Duplex Rewinder introduced by Bagley & Sewall Co., 500 Fifth Ave., New York 18, N. Y. Intended for roll widths from 42 to 92 inches, the machine has hydraulically-



driven differential rewind shafts and its air operated slitters can make strips as narrow as ½ inch. Other desirable features include accurate pressure control between drum and rewind shafts, fully enclosed hydraulic and air piping, and easily accessible controls.

The new Duplex Rewinder is powered by a Louis Allis Eddy current type variable-speed drive. A variable volume pump, driven by an A.C. motor, supplies power to the rewind shafts, and the winder is powered by an Eddy clutch. By placing the entire drive beneath the machine, valuable floor space has been saved. Accurate pressure control and precision winding are achieved by pneumatic cylinders for raising and lowering the rewind arms. For full center winding, rewind shafts can be locked in "out" position.



Tensile High?

SEE PAGE 264

T-C

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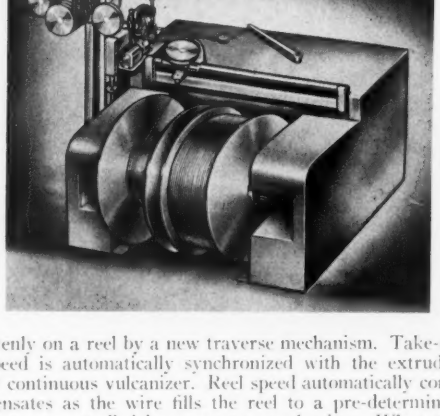
Automatic Class T Dual Take-Up

A fully automatic dual take-up Class T has been introduced by the James L. Entwistle Co., 43 Church St., Pawtucket, R. I. This is said to be the first completely automatic take-up in the wire field. The Class T is used with dancer rolls taking wire from an extruder or continuous vulcanizing machine. The wire is wound



evenly on a reel by a new traverse mechanism. Take-up speed is automatically synchronized with the extruder or continuous vulcanizer. Reel speed automatically compensates as the wire fills the reel to a pre-determined footage controlled by a counter mechanism. When the reel is full, the wire is automatically transferred to the empty reel at high speed by the new design traverse mechanism. A knife moves forward, cuts the wire cross-over between reels, and returns to its original position.

No matter where the traverse was on the full reel just before cross-over, it starts the new reel about 1½ inches in from the inside flange, travels toward the flange and then reverses to hold the end and start the first coil. This new feature eliminates the usual spoilage in starting off a coil. The full reel is automatically stopped by a pneumatic brake. A signal alerts the operator so that, with the aid of a built-in pneumatic lift, he can lower the full reel, remove it, and replace it with an empty reel. This can all be done at the operator's convenience during the time that the reel is being filled. The Dual Take-Up Class T is delivered complete with all electrical and pneumatic drives and controls.

Quick-As-Wink Foot-Operated Air Valve

Quick-As-Wink foot-operated valves, produced by C. B. Hunt & Son, Inc., Salem, Ohio, permit hammers, shears, presses, hopper gates, furnace doors, and all other types of air operated machinery and equipment to be fully controlled simply by foot pressure on a pedal. Consequently, the operator has both hands free to handle the work—speeding production and cutting costs. The valving mechanism has a stainless steel body and push-pull rods, brass sleeves, self-sealing U-shaped packers and many other refinements found only in Quick-As-Wink construction. All operating parts are fully enclosed against the entrance of dust and dirt, and protected within a sturdy cast iron housing, assuring long, efficient, trouble-free operation.

The Eagle SCREAMS AGAIN

Roll Model shown. Needle Model, Mold Model and Combination Instruments also available.

With critical raw stock and mounting labor, materials and operating costs, you simply can't afford to scorch rubber. Make the use of Cambridge Pyrometers a routine procedure during calendering, mixing, extruding and molding. They are accurate, rugged, quick-acting instruments that take guesswork out of temperature determination.

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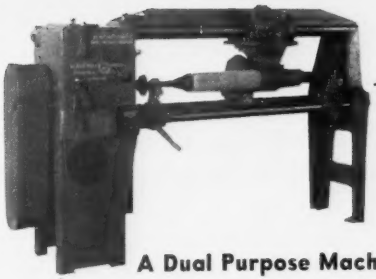

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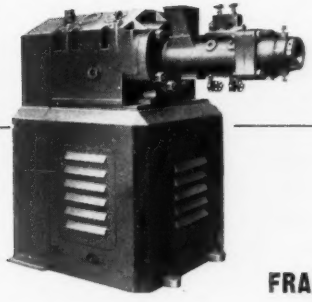

SHAW

The illustration shows the latest type of Shaw Extruder. Can be fitted with variable or constant speed motor mounted in the base for cleanliness and to save floor space.

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R. 202

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POLYCRYL 415 Acrylic Copolymer in Ethyl Acetate. A soft and flexible resin for adhesives, lacquers and paints. Can also be used in artificial leather coatings. Deposits a clear, colorless and extremely elastic film. Supplied as a 50% solution.

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POLYCRYL 420 Acrylic Copolymer in a mineral thinner. Deposits most flexible resin in this series. Recommended where aromatic, ester or ketone solvents must be avoided. Particularly useful for spray applications over oil-type or lacquer-type undercoats. Supplied as 40% solution.

POLYCRYL 427 Acrylic Copolymer in Toluol. Deposits film with intermediate hardness and flexibility. Applications similar to above. Recommended for plasticizing POLYCRYLS 413 and 414 or for hardening POLYCRYLS 415, 419 and 420. Supplied as 50% solution.

POLYCRYL acrylic resins are film-forming thermoplastic resin solutions. For improved gloss, adhesion and toughness, films may be baked at moderate temperatures. Excellent resistance to discoloration at high temperature — good resistance to water, alcohol, alkalis, acids, oils and greases — excellent flexibility and adhesion — low pigment reactivity.

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*"Cellosolve" trade mark Union Carbide & Carbon Co.
†VYNS VYHH trade mark Bakelite Corp.

REVIEWS

BOOKLETS, CATALOGS, etc.

Annual Directory and Year Book of the Tufted Textile Manufacturers Association for 1951. Published by the Tufted Textile Manufacturers Association, Box 256, Dalton, Ga. 8¼ x 11⅛ in. 120 pp. $5.00.

The 1951 issue of the TTMA year book and directory features a review of the organization's activities during 1950 and many feature articles of a specific as well as a general nature. Standards, specifications and industry statistics are all covered. The directory portion of the book presents a listing of all manufacturer members of the organization, both geographically and by classification. A listing of associate members is also provided. The year book is bound in magazine style and features many photographs, charts and graphs.

•

Neoprene Latex Type 735. (Report No. 51-1). By H. H. Abernathy, J. R. Galloway, R. W. Walsh, and W. W. Pockman. Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Delaware. 6¼ x 9¼ in. 16 pp.

As indicated by its title, this technical bulletin is devoted to a description of the properties and applications of Neoprene Latex Type 735, an aqueous dispersion of a special type of polymerized chloroprene especially designed for addition to paper pulp. Suggestions for the treatment of paper pulp with the new neoprene latex are included and procedures for adding the latex to pulp are discussed. One section of the report is devoted to the physical properties of papers containing the new latex.

•

Insulation and Jacket Compounds for Wire and Cable. (Report No. 50-7). By C. E. McCormack and R. H. Baker. Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Delaware. 6¼ x 9¼ in. 44 pp.

As indicated by its title, this technical report suggests compounds of neoprene, rubber and GR-S to be used as insulations and jackets in various types of wire and cable. Recommendations are made for compounds to meet the specifications both of the A.S.T.M. and the Underwriters' Laboratories. The physical properties of all the compounds tested are tabulated with the specification requirements. The compounds discussed run the gamut of the wire and cable field.

•

Road Surface Properties. (Bulletin No. 27). Issued by the Highway Research Board, National Research Council, Washington 25, D. C. 7 x 9½ in. 24 pp. 45c per copy.

This bulletin contains a committee report and reproduction of a paper delivered at the 29th Annual Meeting of the Highway Research Board, held in 1949. The report is that of the Board's Committee on Anti-Skid Properties of Road Surfaces, while the paper is "Field Experiments with Powdered Rubber in Bituminous Road Construction," by T. E. Shelburne and R. L. Sheppe, both of the Virginia Department of Highways. This paper was also published in the February, 1950, issue of RUBBER AGE.

•

Laminated Plastics Made with Bakelite Phenolic Varnishes. Bakelite Division, Union Carbide and Carbon Corp., 300 Madison Avenue, New York 17, N. Y. 8½ x 11 in. 42 pp.

This illustrated booklet provides fundamental facts concerning various grades and types of laminated plastics ranging from sheet stock to plywood crossbanding. It describes how they are produced, and points up their advantages. Case histories of various types and grades of laminated plastics in industrial service are also included together with test data on their physical, chemical and electrical properties as well as the methods employed in their fabrication and finishing.

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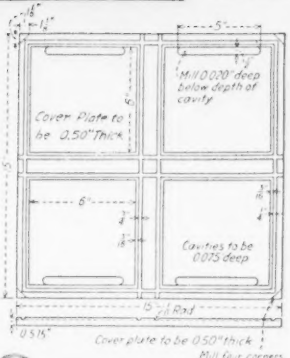
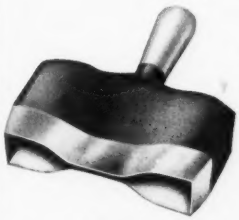

Cover Plate to be 0.50" Thick
Mill 0.020" deep below depth of cavity
Cavities to be 0.075 deep
Cover plate to be 0.50" thick
Mill four corners ⅛ deep for prying mold apart



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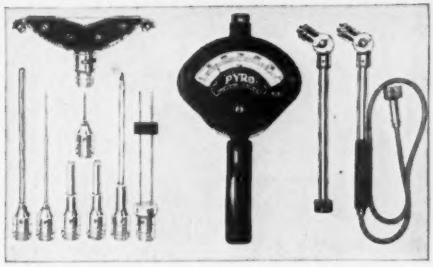

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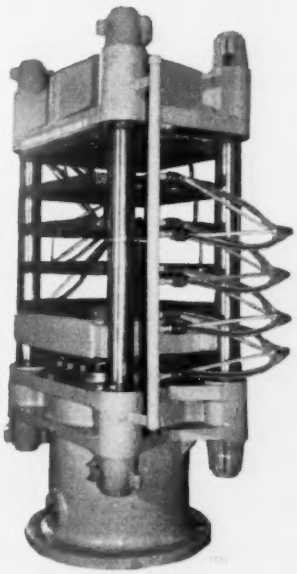

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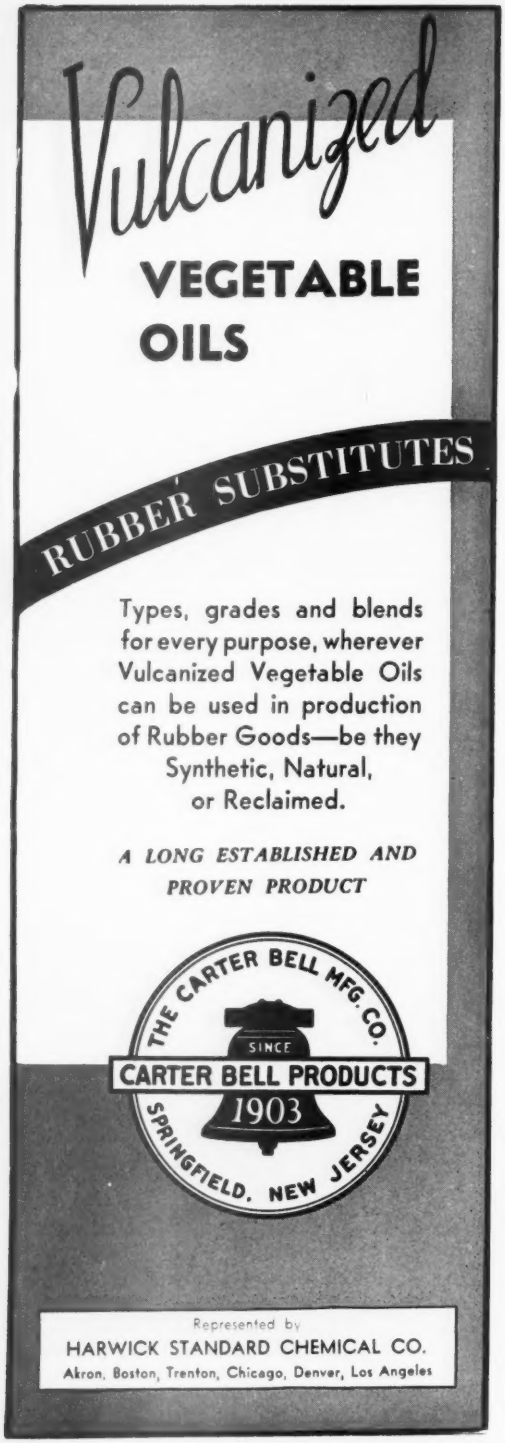
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Heel and Sole Compounding. (Report No. 51-31. By C. E. McCormack and R. S. Graff. Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6¼ x 9½ in. 40 pp.

Problems facing the compounder of heels and soles have changed considerably since the last technical bulletin on the subject was issued by the DuPont Rubber Chemicals Division in 1939. The current report presents up-to-date compounding data which will be of considerable help to the compounder in obtaining the maximum benefit from the materials at his disposal. The report is divided into three sections, the first devoted to natural rubber and GR-S heels and soles, the second to neoprene heels and soles, and the third to crepe soles. Each section contains recommended formulas, with physicals given in each instance. An index is included for the user's convenience.

•

Stretching Highway Dollars with Rubber Roads. By Harry K. Fisher. Natural Rubber Bureau, 1631 K St., N.W., Washington 6, D. C. 6 x 9 in. 36 pp.

Brought up to date by Mr. Fisher, rubber road consultant to the Natural Rubber Bureau, the 1951 edition of this booklet incorporates all of the facts, experiences and conclusions developed to this point with regard to the use of rubber in roads. It describes the various methods by which rubber powder is now being added to asphalt and makes full use of on-the-job photographs and statistics to cover all of the 1950 tests and review the earlier ones. Other uses for natural rubber-asphalt combinations are also suggested in the booklet.

•

New Products: 1951. Arthur D. Little, Inc., 30 Memorial Drive, Cambridge 42, Mass. 8½ x 11 in. 10 pp.

This booklet summarizes the work done by the Arthur D. Little organization on the production, handling and storage of liquefied gases. Included are brief descriptions of the ADL Collins Helium Cryostat, Hydrogen Liquefier, Liquid Oxygen Generator, Helium Refrigerator and Liquid Oxygen Pump—all applicable to work with liquefied gases or to low temperature investigations. Also described are the non-contaminating gas holder, air cooler (for cooling electronic gear), and the ADL high flux density electromagnet. All of the equipment shown is now available from the company's Mechanical Division.

•

Punch-Lok Hose Clamps, Tools and Fittings. (Catalog No. 300). Punch-Lok Co., 321 North Justine St., Chicago 7, Ill. 8½ x 11 in. 12 pp.

This catalog describes and illustrates the Punch-Lok method and its many applications, and lists the standard clamps, locking tools, and special fittings available. It indicates that the Punch-Lok clamps not only serve for making leakproof hose connections on almost any type of hose, but also offer a solution to a wide variety of other clamping and banding problems, such as splicing electric cable, repairing leaks in pipe lines, clamping guy-wire guards, etc.

•

Elmes Hydrolairs. (Bulletin No. 1030-A). Elmes Engineering Division, American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio. 8½ x 11 in. 4 pp.

This bulletin describes and illustrates the company's line of Hydrolair power-operated production presses that have neither motors nor pumps. Advantages, features and specifications are given in detail. The operation of the press is described, with some space devoted to various accessories. Specific advantages of the press for laminating operations are stressed.

•

Cellular Rubber. Sponge Rubber Products Co., Shelton, Conn. 8½ x 11 in. 12 pp.

This catalog is devoted to the company's comprehensive line of Spongex sponge rubber. Described and illustrated are products made from sheet sponge, die cut shapes, cord, tubing and strips, molded forms, and pad stock. Details are given on colors, thicknesses, density, tolerances, etc. A summary of the company's sponge rubber products in tabular form is included.

Triton Surface-Active Agents. Rohm & Haas Co., Washington Square, Philadelphia 5, Penna. 8½ x 11 in. 48 pp.

This technical booklet covers the nature, grades, properties and applications of Triton and Hyamine surface-active agents. Data included will be found useful to chemists and technologists in such widely separated fields as sanitation, metal plating and fire fighting; to manufacturers of insecticides, detergents and cosmetics, to tanners, textile processors and colorists, paper manufacturers and many others. The booklet includes a useful section on the preparation of emulsions. Ten tables record data on surface and interfacial tension values, wetting time, spreading coefficients, foaming volumes, stability and other properties. Also included is an unbound 8½ x 11-inch summary, printed on card stock for ready reference in plant or laboratory, which tabulates, for each of 12 compounds, the chemical structure, recommended solvent, ionic activity, conditions of use and suggested uses.

•

Witco M. R. in Natural and Chemical Rubbers. Witco Chemical Co., 295 Madison Ave., New York 17, N. Y. 8½ x 11 in. 52 pp.

A wealth of specific technical information regarding Witco M. R. No. 38 in both natural and GR-S compounds is contained in this report. Covered in the report are uses in relation to automotive tire treads, bicycle tires, smooth tubing channel compounds, molded slab shoe sole compounds, code wire and ignition cable insulation, garden hose, etc. Mixing and testing procedures are outlined in considerable detail. Natural and GR-S rubber in typical applications were selected for evaluation to give compounders a definite idea of the properties imparted by Witco M. R. No. 38, which is a special blend of petroleum-derived blown asphalts.

•

Properties of and Test Data on Cellular Rubber. Sponge Rubber Products Co., Shelton, Conn. 8½ x 11 in. 24 pp.

This is a comprehensive bulletin on the various types and grades of cellular rubber produced by the company. It goes further in that it is also in a sense a manual, since it covers the specific properties of the material and discusses recommended tests. Sections are devoted to compression, compression set, influence of heat and aging, flexing, tensile and elongation, hardness, insulation value, staining, resistance to oils and chemicals, etc. A summary of the company's sponge rubber products, including Spongex, Cell-Tite, Textfoam, and Texlite, is included in tabulated form, with descriptions and suggested applications given in each instance.

Tensile High?
SEE PAGE 264

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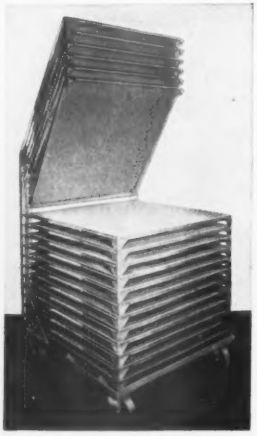


This new Truck gives unobstructed access to three sides of each tray and offers a convenient method for storing materials that require cooling or air drying. The one piece construction Trays are spring supported and can be quickly raised or lowered, free from all locking devices. Trucks having 18 perforated trays 36" x 36" or plain surface trays 36" deep by 4 ft., 6 ft. and 8 ft. long, can be furnished either stationary or mounted on casters.

SPADONE MACHINE COMPANY, INC.
10 East 43rd St. New York 17, N. Y.

Chemigum Rubbers. Chemical Division, Goodyear Tire & Rubber Co., Akron 16, Ohio. 8½ x 11 in. 32 pp.

The properties, compounding and applications of Chemigum, the company's nitrile synthetic rubber, are covered in this new technical booklet. A number of compounds are included with physicals shown, the compounds covering gasoline hose, shoe soles, oil-resistant automotive parts, belt covers, packings, gaskets, etc. Use of Chemigum is general and pressure-sensitive adhesives is covered in a separate section. An extensive appendix includes charts on Mooney breakdown, accelerated aging and chemical resistance, as well as data on raw material costs and a list of raw material suppliers.

•

Bonding Elastomers to Metal with MDI-50. (Bulletin BL-241). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6¼ x 9½ in. 12 pp.

As indicated by its title, this report is devoted to bonding elastomers to metal with MDI-50. The preferred method for using the material is outlined, and in addition the variables which affect adhesion of MDI-50 bonded units are discussed, including variation in assembly procedures, type of metal, type of elastomer, and compounding of the elastomer. Recommended formulas are included.

•

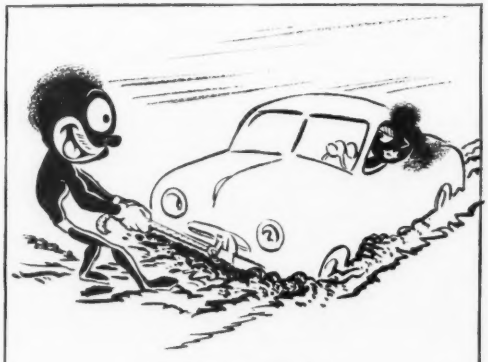
Emery Dimer Acid. Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio. 8½ x 11 in. 16 pp.

This booklet contains a complete description, characteristics, specifications, shipping and handling data, and potential applications of Emery 955 Dimer Acid in soaps, greases, esters, polyamide resins, insecticides, emulsion breakers, etc. Considerable data pertaining to the use of the material in bodied oils, varnishes and alkyd resins is also included. A comprehensive bibliography, numbering over 50 references, is appended.

•

Apparatus Notes. (Bulletin No. 515). Andrew Technical Service, 3805 North Clark St., Chicago 13, Ill. 8½ x 11 in. 16 pp.

Laboratory equipment offered by the company is described and illustrated in this bulletin, including portable autoclaves, midget refrigerators, vacuum control manostats, motor-driven blenders, flash evaporator for heat sensitive solutions, stainless steel filters, stopwatches, non-corrosive pumps, and a selection of laboratory sundries.



Tensile High?
SEE PAGE 264

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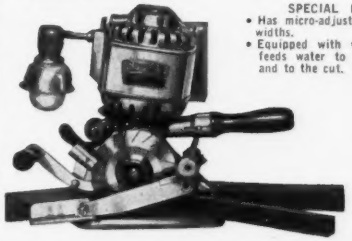

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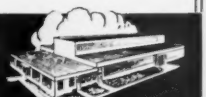

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, JUNE 8, 1951

Natural Rubber

As of June 8, government selling prices for natural rubber remained at the basis of 66c a pound for No. 1 Ribbed Smoked Sheet. As of June 1, government buying prices for No. 1 Ribbed Smoked Sheet for June shipment landed were 49¼c per pound, while on June 4 the price hit a new low of 48¾c.

The fact that stockpile buyers have again reduced their prices will tend to discourage speculators in the primary centers from attempting to support the market on even fair declines. The trend of rubber prices is almost entirely dependent upon official Washington. Even though trade circles have felt that Washington would attempt to support rubber prices for some little time, the action of the government in reducing buying prices has led to the impression that the market has not as yet reached the level which buyers consider satisfactory.

World consumption of natural rubber increased sharply in April, according to figures released by the International Rubber Study Group. Consumption in April of 145,000 tons included imports into Russia of 9,500 tons and into China of 13,750 tons. Production of natural rubber in April was the highest for any month this year, totaling 172,500 tons. The all-time high was set in October, 1950, when 186,000 tons were produced.

World stocks of natural rubber were under 700,000 long tons for the first time since 1945. Total stocks at the end of April of 697,500 long tons showed a decline of 87,500 tons since the end of 1950. Stocks, as reported, show a reduction in consuming areas of 65,000 tons during the month of April. Stocks in consuming areas do not include government stocks which are not available to industry in the United States, the United Kingdom and France.

Shipments of rubber from Indonesia in April reached an unprecedented high of 85,273 long tons. This compares with March shipments of 61,856 long tons, and April, 1950, shipments of 60,049 long tons. Shipments for the first four months of 1951 totaled 269,102 long tons, compared with 147,831 long tons in the first four months of 1950.

Singapore rubber stocks at the end of May showed a reduction of more than 20,000 tons as compared with the supply at the end of April and totaled 64,670 tons, which was still about 11,000 tons less than in May, 1950. Stocks in dealers' hands were down to 42,000 tons. Trade circles state that this indicates reluctance on the part of the trade in Singapore to carry supplies above that which is a working minimum.

General conditions in the over-all rubber picture are such, that the inclination is to look for continued quiet markets with very little price variation, trade sources indicate.

Quotations for the markets in London and Singapore follow:

London Market

(Standard Smoked Sheets)

June	54.25 - 54.83
July-September	51.04 - 51.62

Singapore Market

(Standard Smoked Sheets)

July	48.93 - 49.29

Scrap Rubber

The Scrap Rubber Dealers Industry Advisory Committee has informed NPA that scrap rubber supplies are plentiful and that reclaimers will be able to meet requirements this year. The scrap market has shown only moderate activity as traders await the impending imposition of ceiling prices by the government. The Advisory Committee has indicated that a tailor-made dollars and cents ceiling price regulation would be the most practical type of regulation for the industry. Current quotations follow:

Mixed passenger tires	ton	$29.00
Beadless truck tires	ton	39.00
Mixed truck tires	ton	32.00
Beadless passenger tires	ton	37.00
No. 1 passenger peelings	ton	80.00
No. 1 truck peelings	ton	80.00
Red passenger tubes	lb.	.20
Black passenger tubes	lb.	.14½
Mixed tubes	lb.	.12
No. 2 light colored truck tubes	lb.	.20
Red truck tubes	lb.	.20
Black truck tubes	lb.	.14½
Buffings	ton	45.00

Reclaimed Rubber

According to preliminary estimates by the Department of Commerce, 32,179 tons of reclaim were consumed in April, compared with 32,678 tons consumed in the previous month. The industry continues to operate at top levels while awaiting the issuance of ceiling prices. NPA has estimated the total consumption of scrap by reclaimers in the first quarter of 1951 at an annual rate 25% greater than for the whole year 1950. Current quotations follow:

Tires

Black, Digester (Natural)	lb.	.10½ - .11
Peels No. 1	lb.	.11 - .11½
Whole Tire (Blend)	lb.	.10 - .10½

Inner Tubes

Black (Natural)	lb.	.24 - .25½
Red (Natural)	lb.	.28 - .28¼
Buryl	lb.	.12½ - .13

Cotton Tire Fabrics

Supplies of cotton tire fabrics continue in short supply with quantities on hand barely sufficient to meet heavy military demands. In view of the extremely tight market situation, most suppliers continue their withdrawal from the market. According to the U. S. Bureau of the Census, production of cotton tire fabrics in 1950 totaled 221,473,000 pounds, compared with 163,468,000 pounds in the preceding year. Current quotations follow:

Standard, Peeler, 12/4.2	lb.	.93
Extra Staple, Peeler, 12/4/2	lb.	1.00

Chafers

14.4 oz. (per sq. yard)	lb.	.86½
9.25 oz. (per sq. yard)	lb.	.83
11.65 oz. (per sq. yard)	lb.	.81
8.9 oz. (per sq. yard)	lb.	.84

Cotton

The market for middling uplands on the Commodity Exchange in New York has held at the price of 46.06c since our last report (May 10). There were 22 trading days in May. Trade sources estimate that cotton farmers will plant 28,160,000 acres in 1951, a 5½% increase over the revised planted acreage in 1950 of 18,613,000 acres, and compared with the Department of Agriculture goal of 28,636,000 acres.

The International Cotton Advisory Committee has indicated that the 1951-52 cotton harvest may be the second largest on record at 35,000,000 bales. An all-time record was established in the 1937-1938 season when 38,000,000 bales were harvested. The committee termed its report of a very preliminary nature. The committee also said that cotton stocks are now at one of the lowest levels in history. Stocks on July 1, 1951, are expected to total about 11,000,000 bales, against 16,000,000 bales a year earlier.

Department of Agriculture officials have indicated that the raw cotton export quota in the year starting August 1 probably will be in the neighborhood of 5,000,000 bales exclusive of some 400,000 to 450,000 bales of American cotton which are expected to go to Canada in the 1951-1952 marketing period. Secretary of Agriculture Charles F. Brannan will make the final determination of how large the cotton export allocations for the period should be.

In the current marketing period ending July 31, U. S. raw cotton export allocations are expected to total about 4,200,000 bales, including shipments to Canada, which it not within the quota framework. In the 1949-1950 marketing season, approximately 5,800,000 bales of cotton were shipped abroad. After the first cotton crop report for 1951 comes out on August 8, Agriculture Department officials will be in a better position to determine export quotas.

Quotations for middling uplands on the Exchange follow:

	May 10 Close	June 9 High	June 9 Low	June 9 Close
July	45.17	44.58	44.12	44.28
Oct.	39.45	37.50	37.15	37.45
Dec.	39.08	37.15	36.85	37.15

Synthetic Rubber

(Dry Types—Per Pound)

Butaprene NF	.465	- .475
Butaprene NL	.475	- .485
Butaprene NAA	.515	- .525
Butaprene NXM	.550	- .560
Chemigum 30N4NS	.460	- .470
Chemigum 50N4NS	.460	- .470
Chemigum N3	.450	- .500
GR-I	——	- .2075
GR-S	——	- .245
Hycar OR 25	.450	- .460
Hycar OR-15	.520	- .530
Hycar OS-10	.500	- .510
Neoprene Types CG and AC	——	- .800
Neoprene Type E	——	- .650
Neoprene Types FR and KNR	——	- .800
Neoprene Type GN	——	- .380
Neoprene Type GN-A	——	- .380
Neoprene Type RT	——	- .400
Neoprene Type S	——	- .380
Neoprene Type W	——	- .400
Paracril B	.500	- .510
Paracril BJ	.500	- .510
Paracril C	.580	- .590
Silastic (compounded)	2.35	- 4.40
Thiokol Type A	.370	- .470
Thiokol Type FA	.520	- .620
Thiokol PR-1	.750	- .850
Thiokol Type ST	750	- .850

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   - Mechanical Properties

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SYNVAR CORPORATION
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CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

JUNE 8, 1951

Prices are, in general, f.o.b. works. Range of prices indicates grade or quantity variations.

Abbreviations: bbls., barrels; c.l., carlot; cyl., cylinder; dlvd., delivered; dms., drums; l.c.l., less than carlot; M.B., masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

[a] East of Mississippi.

*For Export Only

—The arrangement of this section follows closely the Chemical Section of the 1949 RUBBER RED BOOK to which readers are referred to determine the classification of any material or brand name. —Although suppliers of every material were contacted for price information, only those materials are listed for which quotations have been furnished us. The quotations are not guaranteed and prospective purchasers should contact suppliers for confirmation before placing orders. Suppliers are requested to send us regularly current prices on all of their materials used in the rubber industry.

ACCELERATORS

A-1 (Thiocarbanilide)	lb.	.44	.51
A-32	lb.	.59	.69
A-77	lb.	.42	.55
A-100	lb.	.42	.55
Accelerator No. 8	lb.	—	.98
Accelerator—49	lb.	.48	.49
Accelerator—89	lb.	—	1.20
Accelerator—122	lb.	—	1.30
Accelerator—552	lb.	—	2.00
Accelerator—808	lb.	.59	.61
Accelerator—833	lb.	1.13	1.15
Acro AC-165	lb.	.37	.39
Altax	lb.	.37	.40
Ancap*	lb.	.27	.29
Ancatax*	lb.	.35	.37
Ancazide* ET	lb.	—	1.00
ME	lb.	—	1.10
Ancazate* BU (ET & ME)	lb.	—	1.00
Arazate	lb.	—	2.16
Beutene	lb.	.59	.61
Bismate, Rodform	lb.	—	3.00
Butasan	lb.	—	1.00
Butazate	lb.	—	1.00
Butyl Eight	lb.	1.00	1.25
Captax	lb.	.29	.32
C-P-B	lb.	—	1.95
Cumate, Rodform	lb.	—	1.45
Dibenzo G-M-F	lb.	—	2.50
Diorthotolylguanidine	lb.	.52	.53
Diphenylguanidine	lb.	.43	.44
El-Sixty	lb.	.45	.52
Ethasan	lb.	—	1.00
Ethazate	lb.	—	1.00
Ethex	lb.	—	1.00
Ethyl Thiurad	lb.	—	1.00
Ethyl Tuex	lb.	—	1.00
Ethylac	lb.	.88	.90
G-M-F	lb.	—	2.50
Good-rite Erie	lb.	.31½	.33½
Guantal	lb.	.47	.54
Harvex	lb.	.52	.57
Hepteen	lb.	.42	.44
Base	lb.	1.80	1.85
Ledate, Rodform	lb.	—	1.00
Mercaptobenzothiazole	lb.	.34	.36
Mercaptobenzothiazyl Disulfide	lb.	.42	.44
Mertax	lb.	.44	.51
Methasan	lb.	—	1.00
Methazate	lb.	—	1.00
Monex	lb.	—	1.10
Mono Thiurad	lb.	—	1.10
Morfex	lb.	.59	.61
2-MT	lb.	—	.75
NA-22 (for neoprene)	lb.	—	1.50
O-X-A-F	lb.	.43	.45
Pentex	lb.	—	1.00
Flour	lb.	—	.20
Permalux (for neoprene)	lb.	—	1.85
Phenex	lb.	.40	.45
Pipazate	lb.	—	1.53
Pip-Pip	lb.	—	2.00
R-2 Crystals	lb.	—	1.95
Rotax	lb.	.42	.44
RZ-50	lb.	—	1.00
SA 52	lb.	—	1.10
SA 57	lb.	—	1.00
SA 62	lb.	—	1.00
SA 66	lb.	—	1.45
SA 67	lb.	—	1.00
SA 77	lb.	—	1.00
Safex	lb.	—	1.15
Santocure	lb.	.64	.71
Selazate	lb.	—	1.45
Selenac (Ethyl, Methyl)	lb.	—	1.45
Setsit-5	lb.	.75	1.00
SPDX-GH (tons)	lb.	.64	.66
G-L	lb.	—	.75
Tellurac	lb.	—	1.45
Tepidone	lb.	—	.55
Tetrone	lb.	—	1.25
A	lb.	—	1.85
Thiofide	lb.	.42	.49
Thionex	lb.	—	1.10
Thiotax	lb.	.34	.41
Thiurad	lb.	—	1.10
Thiuram E	lb.	—	1.00
M	lb.	—	1.10
Trimene	lb.	.54	.56
Base	lb.	1.03	1.06
Tuads, Ethyl	lb.	—	1.00
Tuads, Methyl	lb.	—	1.10
Tuex	lb.	—	1.10
Ultex	lb.	1.00	1.05
Unads	lb.	—	1.10
Ureka Base	lb.	.63	.70
Ureka C	lb.	.68	.75
Vitasan Crystals	lb.	.48	.53
Vulcanex	lb.	—	—
Z-B-X	lb.	—	2.45
Zenite	lb.	.42	.44
A	lb.	.50	.52
B	lb.	.50	.52
Zenite Special	lb.	.43	.45
Zetax (uncoated)	lb.	.38	.41
Zimate, Butyl	lb.	—	1.00
Zimate, Ethyl	lb.	—	1.00
Zimate, Methyl	lb.	—	1.00

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.13¼	.14¼
Fish Oil, Hydrogenated, Fatty Acid			
Hydrofol Acid (dlvd.)	lb.	.20¼	.23
Hytac 430 (dlvd.)	lb.	.20¼	.22
Neo-Fat H.F.O. (dlvd.)	lb.	.14½	.15¾
Stearex Beads (dlvd.)	lb.	.12	.13¼
Lime, Hydrated			
Arrowhead	ton	—	20.65
Marblehead	ton	—	14.30
Sierra	ton	—	19.50
Litharge			
Eagle (dlvd.)	lb.	—	.1875
FSB (dlvd.)	lb.	—	.2050
Magnesium Oxide, Heavy			
General Magnesite 500	lb.	.05	.06½
600	lb.	.06	.08
Michigan No. 15	lb.	.0550	.0600
Permanente	lb.	.05	.06½
Magnesium Oxide, Light			
Baker's (Neoprene Grade)	lb.	—	.31
General Magnesite (Neoprene Grade)	lb.	—	.30
General Magnesite No. 101	lb.	—	.19
General Magnesite Standard	lb.	—	.22
K & M (Neoprene Grade)	lb.	—	.31
Maglite D	lb.	—	.25
M	lb.	—	.31
Marine's (Neoprene Grade (l.c.l.)	lb.	—	.31
Michigan No. 30	lb.	—	.24
No. 40 Extra Light	lb.	—	.31
Witco Extra Light	lb.	.32	.35

ACTIVATORS (Cont'd)

Oleic Acid			
Emersol 210 (dlvd.)	lb.	.23¼	.24½
L.C.P. Red Oil	lb.	.23¼	.24½
Red Oil (20-24 Saponified) (dlvd.)	lb.	.23½	.24¼
Palm Oil Fatty Acid (c.l.)	lb.	.11½	.14½
Potassium Oleate (drums)	lb.	.45	.55
Red Lead			
Eagle	lb.	—	.1975
No. 2 RM (dlvd.)	lb.	—	.2150
Sodium Laurate, 75%	lb.	.64	.74
Sodium Oleate, 75%	lb.	.45	.55
Paste (drums)	lb.	—	.20
Sodium Stearate, 75%	lb.	.45	.55
USP Grade (drums)	lb.	—	.37
Stearic Acid, Single Pressed			
Emersol 110 (dlvd.)	lb.	.21¼	.22½
Groco 53	lb.	.21¼	.22½
Stearex B (dlvd.)	lb.	.15½	.16¾
Stearic Acid, Double Pressed			
Alba (dlvd.)	lb.	.23¼	.25½
Groco 54	lb.	.21¼	.23
S-2-A (dlvd.)	lb.	.21	.23¼
S-2-B (dlvd.)	lb.	.19½	.21¾
Stearic Acid, Other			
Neo-Fat 1-58	lb.	.1190	.1315
1-60	lb.	.1400	.1525
1-65	lb.	.1450	.1575
White Lead Basic Carbonate	lb.	.18½	.19½
White Lead Basic Sulfate	lb.	.13¾	.14¾
Zinc Laurate			
Laurex	lb.	.29	.30
Zinc Stearate	lb.	.46	.48
Aquazinc	lb.	.20	.35

Unclassified Activators

Actifat (dms.)	lb.	—	.18
Aktone	lb.	.20	.21
Barak	lb.	—	.60
Curade	lb.	.57	.59
D-B-A	lb.	—	1.95
Delac J	lb.	.55	.57
Dibutylamine (dlvd.)	lb.	.54¼	.55¼
MODX-B	lb.	.20	.25
NA-11	lb.	—	.65
Polyac	lb.	—	1.60
Ridacto (drums)	lb.	.25	.26
Snodotte (dlvd.)	lb.	.21¾	.23
SOAC (min. 10 dms.)	cwt.	—	8.00
SOAC-KL (min. 10 dms.)	cwt.	—	8.00
Vulklor	lb.	.75	.85

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	lb.	.17	.21
Aqua Ammonia (dms.)	lb.	.031	.035
M.B.M. (l.c.l.)	lb.	—	.35

ANTI-FOAMING AGENTS

Aero Anti Foam H	lb.	—	.12½
Regular	lb.	—	.08½
D.C. Antifoam A	lb.	5.65	6.65
Defoamer 630	lb.	—	.12½
Modicol A	lb.	.12	.15
B	lb.	.35	.40

ANTI-OXIDANTS

Agerite Alba	lb.	2.20	2.30
Gel	lb.	.60	.62
Hipar	lb.	.91	.93
H. P.	lb.	.67	.69
Powder	lb.	.49	.51
Resin	lb.	.65	.67
Resin D	lb.	.49	.51
Stalite	lb.	.49	.51
White	lb.	1.40	1.50
Akroflex C	lb.	.67	.69
F	lb.	.67	.69
Aminox	lb.	.49	.51
Antioxidant 2246	lb.	1.60	1.63
Antox	lb.	.49	.51
Aranox	lb.	—	3.25
Benzoquinone	lb.	1.50	1.75
Betanox Special	lb.	.70	.72
B-L-E	lb.	.49	.51
Carvacrol	lb.	—	.78
Deenax	lb.	.95	1.05
Eugenol C-95%	lb.	—	1.65
Flectol H	lb.	.49	.56
Flexamine	lb.	.67	.69
Neozone Standard	lb.	—	.82
A	lb.	.51	.53
C	lb.	—	.67
D	lb.	.49	.51

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ANTI-OXIDANTS (Cont'd)

Oxidex	lb.	—	3.00
Parasone	**lb.**	**—**	**.75**
PDA-10 and 20	lb.	.36	.38
Permalux	lb.	—	1.85
Resorcin, Tech. (dlvd.)	**lb.**	**—**	**.64**
Santoflex AW	lb.	.66	.73
B	lb.	.49	.56
BX	lb.	.60	.67
35	lb.	.67	.74
Santovar-A	lb.	1.40	1.47
O	lb.	1.20	1.27
Santowhite Crystals	lb.	1.55	1.62
Santowhite L	lb.	.49	.56
MK	lb.	1.25	1.32
S.C.R. (tons)	**lb.**	**.32**	**.34**
Sequestrene AA	lb.	—	1.00
NA2	lb.	—	.82
NA3	lb.	—	.80
Stabilite	lb.	.49	.51
Alba	lb.	.69	.74
L	lb.	.60	.62
White	lb.	.49	.51
Stabilizer No. 1	lb.	—	1.55
Stabilizer No. 320	lb.	—	.75
Sunolite	lb.	.20	.23
Tannic Acid, Tech.	lb.	.46	.48
Thermoflex	lb.	1.61	1.63
A	lb.	.98	1.00
V-G-B	lb.	.65	.67
Wing-Stay S	lb.	.48	.49

ANTI-SCORCHING AGENTS

Armeen HT	lb.	.34	.42
Benzoic Acid—Tech.	**lb.**	**—**	**.43**
Good-rite Vultrol	lb.	.55	.57
Sodium Acetate 60-62% Crystals	**lb.**	**—**	**.06**

ANTISEPTICS AND GERMICIDES

Arquad S	lb.	.22	.25
Formaldehyde (dms.)	lb.	—	.062
G-4 (dbls.)	lb.	.95	2.95
G-11	lb.	—	3.45
Nuodex 100 S.S. (dlvd.)	lb.	—	1.10
Nuodex 100 W.D. (dlvd.)	lb.	—	1.25
Nuodex Zinc 8% (dms.) (dlvd.)	lb.	.24	.28
Ortho Cresol (26°-27°)	lb.	—	.201
Retarder D	lb.	.42	.50
Soligen Drier—Copper 8% (drums)	lb.	—	.22¾
Zinc 8% (dms.)	lb.	—	.21¼
Vancide	lb.	—	.80

ANTI-WEEBING AGENTS (for Latex)

Webnix 33	lb.	1.50	2.25
34	lb.	1.75	2.25

AROMATICS (DEODORANTS)

Bouquet 149	lb.	—	3.00
Coumarin	lb.	—	2.75
Curodex 19	lb.	—	4.75
188	lb.	—	5.75
198	lb.	—	6.75
Deodorant 65	lb.	—	1.00
Deodorant L-37	lb.	2.00	2.40
L-44	lb.	2.50	2.90
N.L.T.X.	lb.	1.85	2.15
Deodorant Oil GD 3427	lb.	1.70	2.00
4440	lb.	3.00	3.50
5296	lb.	1.30	1.60
General Deodorant 18301.	**lb.**	**—**	**2.90**
Latex Perfume $	lb.	—	3.25
6	lb.	—	7.50
9	lb.	—	.65
Naugaromes (dms.)	**lb.**	**1.50**	**3.00**
Neutrodor 31	lb.	2.00	2.50
Neutroleum Delta	lb.	—	2.60
Gamma	lb.	—	2.60
Parador A	**lb.**	**1.75**	**2.25**
B	**lb.**	**.70**	**1.00**
C	**lb.**	**2.75**	**3.25**
D	**lb.**	**1.50**	**2.00**
E	**lb.**	**.25**	**.55**
F	lb.	.32	.47
GD 5280	lb.	2.00	2.50
GD 5348	**lb.**	**1.90**	**3.25**
I	lb.	1.95	2.25
K	lb.	.45	.60
Perfume Oil Bouquet Vanilla M	lb.	2.40	2.75
Resodor 11	lb.	2.00	2.50
12	lb.	1.45	1.75
Rodo No 0	**lb.**	**4.00**	**4.50**
No. 10	**lb.**	**5.00**	**5.50**
Rubbarome (dms.)	lb.	1.00	3.80
Rubber Perfume 12	lb.	—	2.85
Russian Leather 7	**lb.**	**—**	**4.10**
Vanillin	lb.	3.00	4.05

BLOWING AGENTS

Ammonium Bicarbonate (dlvd.)	lb.	.0721	.1075
Blowing Agent CP-975	**lb.**	**—**	**.35**
Sodium Bicarbonate, U.S.P. (c.l. bags)	cwt.	—	1.95
Sponge Paste	lb.	—	.20
Unicel	lb.	—	.82
ND	lb.	—	1.40
S	lb.	—	.20
Urea	lb.	.0425	.0475

BONDING AGENTS

Durez 12987	lb.	.48	.53
MDI	**lb.**	**7.00**	**7.75**
50	lb.	2.75	3.25
Pliobond 20	gal.	2.75	4.00
30	gal.	3.45	4.70
Reanite	gal.	6.75	7.25
Rex Compounds	**gal.**	**1.30**	**2.85**
Ty-Ply Q (BN & S)	gal.	6.75	8.00

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	8.11	8.61
Glacial—99½% (bbls.)	cwt.	14.05	14.55
Calcium Nitrate, Tech.., Crystals	lb.	.07	.17
Hydroxyacetic Acid—70% (dms.)	lb.	—	.084
Zinc Nitrate, Tech.	lb.	—	.22½

COLORING AGENTS

Black

Aquablak B (also M, R)	lb.	.07¼	.11¾
Aquablak S	lb.	.11½	.12
Black Shield 4-35 (dms.)	**lb.**	**—**	**.0825**
Carbon Black—See *Reinforcing Agents*			
Lampblack No. 10	lb.	.06	.09
Mapico Black Iron Oxide (50 lb. bags)		.11¾	.12
Raven Black Pure Iron Oxide	cwt.	11.00	11.25

Blue

Blue GD, Dispersed	lb.	—	4.55
Blue GD Paste	lb.	—	1.80
Blue YD, Dispersed	lb.	—	2.75
Milori Blue 11840 (dlvd.)	lb.	—	.37
Monastral Fast Blue CPL	lb.	—	1.77
PCD, Dispersed	lb.	—	2.50
Ramapo Blue	lb.	3.40	3.45
Rubber Blue X-1999	lb.	—	1.15
Stan-Tone Blue	lb.	1.40	4.00
Ultramarine	lb.	.14	.30
Vansul Blue M.B.	lb.	.90	2.40
Victoria Blue BP-262-D	lb.	2.25	2.30

Brown

Brown Iron Oxide	lb.	.12	.1225
Mapico Brown (50 lb. bags)	lb.	.1214	.13

Green

Filo Green D-700 (and D-705)	lb.	—	.30
Green Chromium Oxide, Pure	cwt.	34.50	40.50
Green Chromium Oxide, Pure, Hydrated	cwt.	85.00	100.00
Green FD, Dispersed	lb.	—	1.85
Monastral Fast Green GSD, Dispersed	lb.	—	3.20
GSL	lb.	—	1.97
Permansa Green CP-594	lb.	—	1.35
Pigment Green B	lb.	—	1.35
GL-652D	lb.	.88	.93
Ramapo Green	lb.	—	4.00
Rubber Green X-1292	lb.	—	1.00
Stan-Tone Green	lb.	1.50	3.30
Vansul Green M.B.	lb.	1.05	2.45

Maroon

Stan-Tone Maroon	lb.	3.00	3.05
Vansul Maroon M.B.	lb.	1.05	2.80

Orange

Molybdate Orange	lb.	—	.45
Orange FD, Dispersed	**lb.**	**—**	**2.75**
Rubber Orange X-2065	lb.	—	2.60
Stan-Tone Orange	lb.	1.65	4.00
Vansul Orange M.B.	lb.	2.15	3.15

Red

Antimony Trisulfide	**lb.**	**.55**	**.68**
R. M. P. Sulfur Free	**lb.**	**.63**	**.68**
R. M. P. No. 3	lb.	.55	.60
Cadmium Red	lb.	.95	1.25
Cadmolith Red (bbls.)	lb.	1.30	1.55
Graphic Red (dlvd.)	lb.	—	.80
Indian Red, American, Pure	cwt.	11.75	12.00
Doxco (English)	cwt.	11.50	11.75
Mapico Reds (50 lb. bags)	lb.	.1225	.1250
Oximony Iron Oxide	lb.	—	.09
Red Iron Oxide, Light	cwt.	11.75	12.00
Red PBD, Dispersed	lb.	—	1.75
2BD, Dispersed	lb.	—	1.80
2BL	lb.	—	1.32
PBL	lb.	—	1.65
Rubanox Red CP-762 (dlvd.)	lb.	—	1.40
Rubber Red CP-339 (dlvd.)	lb.	—	1.05
Rubber Red RT-364	lb.	—	.75
Rubber Red RT-425	lb.	—	.75
Rubber Red X-1148	lb.	—	.80
Rubbered	lb.	.1150	.1175
Solfast Red CP-663 (dlvd.)	lb.	—	1.80
CP-787 (dlvd.)	lb.	—	1.30
Stan-Tone Red	**lb.**	**1.10**	**3.05**
Sun Burnt Red	lb.	.1150	.1175
Vansul Red M.B.	lb.	.90	2.60
Watchung Red	lb.	—	1.90

White—Lithopone

Albalith	lb.	.07½	.08½
Astrolith	lb.	.06½	.07¼
Cryptone BT	lb.	.09¾	.10¾
Eagle	lb.	.06¼	.06½
Permalith	lb.	.06¼	.06¾
Ponolith	lb.	.07¼	.08¼
Sunolith	lb.	.06½	.07¼

White—Titanium Pigments

Ti-Cal	lb.	.08	.08¼
Ti-Pure	lb.	.21	.24
Titanox A—all grades (dlvd.)	lb.	.19½	.20½
RA (dlvd.)	lb.	.21½	.22½
RA-10 (dlvd.)	lb.	.21½	.22½
RA-NC (dlvd.)	lb.	.21½	.22½
RC (dlvd.)	lb.	.07¾	.08¼
RC-HT (dlvd.)	lb.	.07½	.08
Unitane O-220	**lb.**	**.195**	**.205**
OR-250	**lb.**	**.215**	**.225**
Zopaque	**lb.**	**.19½**	**.20½**

White—Zinc Oxide (American Process)

AZO-ZZZ 11 (and 22, 33, 44, 55)	lb.	.16	.17
Eagle	lb.	.16	.17
Horse Head Special	lb.	.16	.17
XX Red	lb.	.16	.17
XX-503	lb.	.17½	.18½
Protox 166	lb.	.16	.17
167	lb.	.16	.17
St. Joe Black Label	lb.	.16	.17
Green Label	lb.	.16	.17
Red Label	lb.	.16	.17

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	—	13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.18¼	.19¼
Eagle Green Seal	lb.	.17¼	.18¼
Eagle Red Seal	lb.	.17¼	.18¼
Eagle White Seal	lb.	.18¼	.19¼
Florence Green Seal	lb.	.17¼	.19¼
Red Seal	lb.	.17¼	.18¼
White Seal	lb.	.18¼	.19¼
Kadox 25	lb.	.18¼	.19¼
Kadox 15, 17 and 72	lb.	.16	.17
U. S. P. 12	lb.	.19¼	.20¼

White—Zinc Sulfide

Cryptone ZS-800	lb.	.24	.25

Yellow

Anchor Brand Pure Iron Oxide	cwt.	9.00	9.25
Cadmolith Yellow (bbls.)	**lb.**	**—**	**.95**
Chrome Yellow	lb.	—	.32
Chrome Yellow 12310	lb.	—	.28
Ferrox	cwt.	7.50	8.50
Mapico Yellow (50 lb. bags)	lb.	.1000	.1025
Rubber Yellow X-1940	lb.	—	1.60
Stan-Tone Yellow	lb.	1.00	2.25
Toluidine Yellow	lb.	—	1.91
YL-556-D	lb.	—	.82
Oximony Iron Oxide	lb.	—	.06¾
Vansul Yellow M.B.	lb.	.95	1.55
Yellow GD, Dispersed	lb.	—	2.15
GL	lb.	—	1.62
Zinc Yellow	lb.	—	.27

DISPERSING AGENTS

Anchoid*	lb.	.24	.25
Armeen 18	lb.	.42	.50
Darvan No. 1 (and No. 2)	lb.	.21	.40
Daxad 11 (21, 23)	**lb.**	**.08**	**.35**
Dispersaid	lb.	1.25	1.35
Furala	lb.	.06½	.07½
Halloid	lb.	.04½	.05½
Marasperse C	lb.	.06	.06½
CB	lb.	.11½	.13½
N	lb.	.09	.10
Modicol C	lb.	.08	.12
Rubbex	lb.	.267	.285
Stan-Chem BQC	**lb.**	**.12¼**	**.17¾**
1067	lb.	—	.13½
1471	lb.	.1687	.2187
2251	lb.	.12¼	.17¾
Trenamine D-25	**lb.**	**.32½**	**.36**
Triethanolamine (drums) (dlvd.)	lb.	.21½	.22½
Yelkin TT	lb.	.14	.18
Zinsper	lb.	—	.15

EXTENDERS

Advagum 1098	lb.	—	.64
Bunaweld Polymer No. 780	**lb.**	**—**	**.22**
No. 5514	lb.	—	.35
D-92 (and D-93) (dms.)	lb.	—	.12
Extender 600	lb.	—	.1480
PR-162 Latex Extender	gal.	—	1.55
Synprolac	lb.	.16	.23
Synprowax	lb.	—	.23
Vistanex	lb.	—	.32

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D. C. Resistivity (megohm-cc)	5.2×10^8
Dielectric Constant (at 1 K. C.)	4.23
Power Factor (at 1 K. C.)	.00131
AFTER 7 DAYS IN H_2O AT 70°C	
Water Absorption (mg./sq. in.)	12.5
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Cambridge 40, Massachusetts

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite	lb.	.19½	- 1.30
Lionite	lb.	.14	- 1.20
Pumice	lb.	.03	- .05
Aluminum Hydrate	lb.	.07	- .10
Aluminum Silicate			
Marter White	ton	18.50	- 30.00
Barium Carbonate (l.c.l.)	ton	72.50	- 90.00
Barytes			
No. 1 Floated, White	ton	37.60	- 52.40
No. 2 Floated, Unbleached	ton	35.60	- 50.40
No. 22 Barytes (c.l.)	ton	——	- 20.00
Foam A	ton	——	- 34.85
Bentonite (c.l.)	ton	——	- 11.50
SPV Volclay (c.l.)	ton	——	- 11.50
Blanc Fixe	ton	72.50	-120.00
Calcium Carbonate			
Atomite (c.l.)	ton	——	- 30.00
B.I. White No. 1 (c.l.)	ton	——	- 7.50
B.I. White No. 2 (c.l.)	ton	——	- 7.00
Blue Star XX	ton	——	- 15.50
Calcene T	ton	60.00	- 70.00
Caltec	ton	40.00	- 57.50
Calwhite	ton	——	- 17.00
Camelwite	ton	——	- 30.00
Gamaco	ton	——	- 30.00
Kalite (c.l.)	ton	——	- 50.00
Laminar	ton	——	- 30.00
Lesamite (c.l.)	ton	——	- 27.50
Millical (c.l.)	ton	——	- 32.50
Multifex	ton	——	-105.00
Non-Fer-Al	ton	——	- 25.00
Purecal M	ton	45.00	- 60.00
U	ton	120.00	-135.00
Sierracal	ton	15.00	- 18.50
Super Multifex	ton	——	-160.00
Surfex (c.l.)	ton	——	- 35.00
Suspenso (c.l.)	ton	——	- 30.00
Witcarb R (c.l.)	ton	110.00	-120.00
R-12 (c.l.)	ton	71.00	- 76.00
York White	ton	——	- 9.00
Calcium Silicate			
Silene EF	ton	120.00	-130.00
L	ton	125.00	-135.00
Calcium Sulfate, Anhydrous			
Snow White Filler	ton	——	- 18.00
Calcium Sulfate, Hydrous			
Crysta-Cal (c.l.)	ton	——	- 12.50
Terra Alba No. 1	ton	12.00	- 14.40
Chalk Whiting (l.c.l.)	lb.	.0150	- .0175
Recco Paris Whiting	ton	——	- 28.00
Clay			
Alsilite (c.l.)	ton	14.00	- 22.50
Alsite (c.l.)	ton	——	- 14.00
Aluminum Flake	ton	22.50	- 60.00
A.S.P. No. 1 (c.l.)	ton	——	- 35.00
No. 11 (c.l.)	ton	——	- 40.00
Buca (c.l.)	ton	——	- 45.00
Burgess No. 20	ton	——	- 35.00
No. 30	ton	——	- 37.00
Burgess Iceberg	ton	——	- 50.00
Burgess Polyclay	ton	——	- 45.00
Catalpo (c.l.)	ton	——	- 35.00
Champion	ton	——	- 14.00
C.S.D. (c.l.)	ton	——	- 13.50
Crown	ton	——	- 14.00
Dixie (c.l.)	ton	——	- 14.00
Hi-White R	ton	——	- 13.50
Hydratex R	ton	——	- 30.00
Kaolloid Clay (c.l.)	ton	——	- 10.50
Markham (c.l.)	ton	14.00	- 35.00
McNamee (c.l.)	ton	——	- 13.50
Oldham (c.l.)	ton	13.50	- 35.00
Paragon	ton	——	- 13.50
Pigment 5	ton	21.85	- 36.00
Pigment 22	ton	16.50	- 22.50
Pigment 33	ton	——	- 37.00
Recco (c.l.)	ton	——	- 14.00
RX-43	ton	——	- 33.00
Stan-Clay	ton	25.00	- 30.00
Stellar-R	ton	——	- 50.00
Suprex	ton	——	- 14.00
Upton	ton	19.50	- 21.50
Whitetex (c.l.)	ton	——	- 50.00
Diatomaceous Earth	ton	30.00	- 50.00
Kaylorite (c.l.)	ton	——	- 30.00
Lorite	ton	——	- 30.00
Flock			
Cotton, white and colored	lb.	.10	- .22
Filfloc F 40-9000	lb.	——	- .16
Filfloc F 6000	lb.	——	- .16
Polyeel	ton	145.00	-178.00
Rayon, bleached or dyed	lb.	.81	- 1.50
Rayon, grey	lb.	——	- .18
Rayon, pink	lb.	——	- .14
Solka-Floc (l.c.l.)	lb.	.07	- .16
Wool, bleached or dyed	lb.	.70	- 1.00
Glue, Bone (dlvd.)	lb.	.18	- .20½
Leather, Shredded	lb.	.05	- .17
Lignin	lb.	.03	- .06
Indulin	lb.	.09	- .10
Limestone, Pulverized	ton	3.25	- 10.00
Industrial Filler No. 100	ton	——	- 5.75
Micro Velva	ton	48.00	- 48.00
Velvet Filler, Regular	ton	——	- 25.00
Superfine	ton	——	- 27.00
Magnesium Carbonate	lb.	.0950	- .1050
K & M Clearcarb	lb.	.1225	- .1275
Magnesium Oxide	lb.	.05	- .06
Magnesium Silicate	ton	18.00	- 35.00
Airex	ton	25.00	- 27.00
Asbestol	ton	20.00	- 22.00
Blue Star Talc	ton	——	- 23.00
L.S. Silver	ton	23.50	- 25.50
Sierra White	ton	21.25	- 23.25

FILLERS (Cont'd)

Mica	lb.	.01¼	- .07¾
Concord	lb.	.07	- .07¾
Micro-Mica	lb.	.06¾	- .07½
Mineralite (c.l.)	ton	25.00	- 40.00
Silversheen	lb.	.07	- .07¾
Triple A Mica (c.l.)	ton	——	- 25.00
Vermiculite	lb.	——	- .11
Wet Ground Biotite Mica	lb.	.05½	- .06¼
Wet Ground Mica No. 160	lb.	.07	- .07¾
Pyrophyllite			
Pyrax A (c.l.)	ton	——	- 12.50
WA (c.l.)	ton	——	- 15.00
Silica	ton	16.00	- 27.00
Blue Star	ton	——	- 20.60
Slate, Powdered (l.c.l.)	ton	15.00	- 20.00
Talc, Domestic	ton	10.00	- 27.00
Nytal 200	ton	23.00	- 40.00
300	ton	35.00	- 52.00
Walnut Shell Flour	ton	45.00	-111.00
Whiting, Commercial	ton	——	- 7.00
Cameline (c.l.)	ton	8.50	- 10.00
C-C-O White	ton	——	- 17.00
Keystone (c.l.)	ton	——	- 16.00
Rambo No. 1 White	ton	——	- 8.50
No. 6 White	ton	——	- 9.00
Snowflake (c.l.)	ton	——	- 18.00
Veroc (c.l.)	ton	——	- 8.50
Welco (c.l.)	ton	——	- 7.50
York White R (c.l.)	ton	——	- 8.00
Wood Flour	ton	22.00	- 49.00

FINISHING MATERIALS, SURFACE

Beaco Finishes	gal.	2.10	- 2.35
Black Out	gal.	4.50	- 8.00
Shellac, Orange Gum	lb.	.45	- .54
VanWax	gal.	1.25	- 1.30

FLAME RETARDANTS

Celluflux	lb.	.36½	- .38½
Chlorinated Paraffin 42	lb.	——	- .12¼
Halowax	lb.	.24	- .39
Zinc Borate 3167	lb.	.18½	- .19½
Zyrox	lb.	.50	- .79

LUBRICANTS, MOLD

Aquadag	lb.	3.50	- 4.00
Aquarex D	lb.	——	- .80
L—Paste	lb.	——	- .94
ME	lb.	——	- .97
MDL Paste	lb.	——	- .33
WA Paste	lb.	——	- .28
Akro Gel	lb.	——	- .165
Borax, Granular (l.c.l.)	ton	81.00	- 86.00
Carbowax 4000	lb.	.31	- .35
Colite Concentrate (dms.)	gal.	——	- .90
Concentrex	lb.	——	- .25
D.C. 7 Compound	lb.	6.20	- 6.80
D.C. Emulsion No. 35	lb.	1.59	- 3.50
35A	lb.	1.59	- 3.50
35B	lb.	1.59	- 3.50
D.C. Mold Release Fluid	lb.	3.70	- 6.00
Dipex	lb.	.14	- .18
Dri-Lube	lb.	——	- .22
Glydag	lb.	1.30	- 2.00
Hawkeye Flake (dlvd.)	lb.	——	- .12
Kokobace	lb.	——	- .12
Latex-Lube GR (dlvd.)	lb.	.18½	- .19¼
R-66 (dlvd.)	lb.	——	- .15
Liqui-Lube (dlvd.)	lb.	——	- .14¾
NF (dlvd.)	lb.	——	- .15¼
NT (dlvd.)	lb.	——	- .15¾
Lubrex	lb.	.25	- .30
Lubri-Flo	gal.	10.00	- 12.00
Migralube	lb.	——	- .35
Mold Lubricant No. 72 Conc.	gal.	2.50	- 4.00
No. 733	gal.	1.26	- 2.75
Moldeze No. 3	gal.	5.00	- 6.00
Mold-Brite	gal.	——	- 1.50
Mold-Stick	lb.	.253	- .271
Mold-White	gal.	——	- 2.00
Nopcolube	lb.	——	- .15
Orvus WA Paste (dms.)	lb.	——	- .25
Prodag	lb.	.28	- .42
Purity Flake (dlvd.)	lb.	——	- .14
Redotex Flakes (dlvd.)	lb.	.21⅜	- .22
Powder (dlvd.)	lb.	.21⅞	- .22½
Rubber-Flo	gal.	1.15	- 1.50
Rubber-Glo	gal.	——	- .94
Rusco Mold Paste	lb.	——	- .25
Sericite (l.c.l.)	ton	65.00	- 75.00
Thermalube	lb.	——	- .13¾
Ulco Mold Soap	lb.	.12	- .23
Ucon Lubricants	lb.	.27½	- .35½
Werkrite Flakes (dlvd.)	lb.	.18⅜	- .19
Powder (dlvd.)	lb.	.19⅛	- .19¾

LUBRICANTS, RUBBER

Extrud-o-Lube	gal.	——	- 1.84
G.B. Naphthenic Neutrals	gal.	.11	- .18
Propylene Stearate (dms.)	lb.	.68	- .78

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.47	- .48
Calcium Stearate	lb.	.44	- .46
Glycerized Lubricant	gal.	——	- 1.48
Polyethylene Glycol	lb.	——	- .23
Rexanol	lb.	——	- .13
Separex	lb.	——	- .25
Slab-Dip	lb.	——	- .15
Wet-Zinc	lb.	——	- .23¼
Zinc Stearate	lb.	.46	- .48

MOLD CLEANERS

Actusol (dlvd.)	gal.	1.40	- 1.60
Metso 99	cwt.	4.00	- 5.85
Granular	cwt.	3.50	- 5.15
Rubber-Sol	gal.	2.75	- 3.25
Sheiblast	ton	80.00	-140.00
Sprex A.C. (dlvd.)	lb.	.15¼	- .15½

PEPTIZING AGENTS

Peptizer P-12	lb.	.84	- 1.00
RPA 2	lb.	——	- .75
3	lb.	——	- .46
3-RO	lb.	——	- .49
5	lb.	——	- .57

PLASTICIZERS & SOFTENERS

AA (drums)	lb.	.35½	- .37¼
Acto 500	lb.	——	- .09
Adipol BCA (dms.)	lb.	.43½	- .44
2EH	lb.	.42	- .43
10A	lb.	.42	- .43
American Pine Tar	lb.	.0350	- .0473
Arneel	lb.	.22	- .27
Arolene 1980 (c.l.)	lb.	——	- .10
Aromatic Tar	gal.	.0573	- .1973
Bardol	lb.	.02½	- .03½
B	lb.	.05¾	- .06
Bayol D	gal.	——	- .383
F	gal.	——	- .52
Beeswax, Refined & Bleached	lb.	.60	- .65
Yellow Refined	lb.	.52	- .55
Bondogen	lb.	.55	- .60
B.R.C. No. 20	lb.	.0150	- .0160
B.R.H. 2	lb.	.0280	- .0290
BRS 700	lb.	.0175	- .0260
B.R.T. 3	lb.	.024	- .025
4	lb.	.0225	- .0233
7	lb.	.0265	- .0275
B.R.V.	lb.	.0350	- .0515
Bunarex Resins	lb.	.06½	- .07½
Bunatak AH	lb.	.08	- .09
U	lb.	——	- .15
No. 90	lb.	——	- .08
No. 210	lb.	——	- .12
Burgundy Pitch	lb.	.0843	- .0888
Butac	lb.	.10½	- .11½
Butoxyethyl Diglycol Carbonate	lb.	.40	- .41
Butyl Benzyl Sebacate	lb.	.61	- .63¾
Butyl Carbitol Perlargonate (dms.)	lb.	——	- .64
Butyl Cellosolve Perlargonate (dms.)	lb.	——	- .68
Butyl Palmitate	lb.	——	- .26½
Butyl Roleate	lb.	.176	- .18
Butyl Stearate-CP (dms.)	lb.	.31	- .33¾
BWH-1	lb.	——	- .14
Cahflex Di-BA (dms.)	lb.	.42	- .44¾
Di-OA (dms.)	lb.	.43½	- .46¼
Di-OP (dms.)	lb.	.40	- .42¾
Califlux 510, 550	lb.	.025	- .0325
G.P.	lb.	.0125	- .02
R-100	lb.	.04½	- .05¾
TT	lb.	.02	- .02¾
Candelilla Wax Prime	lb.	.67	- .75
Capryl Benzyl Sebacate	lb.	.67½	- .70¼
Carbonex	lb.	.0325	- .0375
S Flakes	lb.	.04	- .0475
S Plastic	lb.	.0410	- .0460
644	lb.	.0375	- .0425
Carbowax 4000 (drums)	lb.	——	- .29
Cardolite 615	lb.	.33¾	- .36¾
816	lb.	.25¾	- .28¾
Carnauba Wax, Crude	lb.	.80	- 1.04
Refined	lb.	.87	- .94
Substitute	lb.	.45	- 1.08
Yellow	lb.	1.15	- 1.20
Celluflex (dms.)	lb.	.34	- .35
Ceresine Wax	lb.	.14	- .26
Chlorowax 40	lb.	.13	- .15
Contogum	lb.	.06¾	- .10¼
CTLA Polymer	gal.	.17½	- .32½
Cumar Resins	lb.	.05½	- .14½
D.C. 200 Fluid	lb.	4.14	- 6.00
D.B.M.	lb.	——	- .30
Degras, Common	lb.	——	- .12
Dibenzyl Sebacate	lb.	.74	- .76¾
Dibutoxethyl Sebacate	lb.	——	- .663
Dibutyl Phthalate	lb.	.29¼	- .32
Dibutyl Sebacate—Tech.	lb.	.59	- .61¾
C.P.	lb.	.61	- .63¾
Dicapryl Adipate	lb.	.40½	- .43¼
Dicapryl Phthalate	lb.	.37	- .39¾
Dicapryl Sebacate	lb.	.61½	- .64¼
Di-Carbitol Phthalate (dms.)	lb.	.41½	- .42
Dicyclohexyl Phthalate	lb.	——	- .42
Diethyl Phthalate (t.c.)	lb.	——	- .24
Di-2-ethlyhexyl Phthalate (t.c.)	lb.	——	- .37
Dihexyl Adipate	lb.	.33	- .35¾
Dihexyl Phthalate	lb.	.28½	- .31¼
Dihexyl Sebacate	lb.	.50	- .52¾
Di Isobutyl Azelate (dms.)	lb.	.54	- .57
Di-iso-octyl Adipate (dms.)	lb.	.40½	- .43¼
Di-iso-octyl Phthalate (t.c.)	lb.	.37	- .39¾
Dimethyl Phthalate (t.c.)	lb.	——	- .23
Dimethyl Sebacate	lb.	.77	- .79¾
Dioctyl Phthalate (dms.)	lb.	.37	- .39¾
Dioctyl Sebacate (dms.)	lb.	.62½	- .65¼
D.I.O.P. (dms.)	lb.	.36	- .38½
Dipolymer Oil	gal.	——	- .33

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ZINC STEARATE #903—Fine particle size and slip.
ZINC STEARATE #904—For dusting agent and mold lubricant. Preferred over talc, chalk, starches for dusting to prevent dull or gray product finish.
ZINC STEARATE #901—Recommended for its adhesive and covering characteristics.
ZINC STEARATE #1347—A special grade, processed to meet conditions not satisfied by regular grades.

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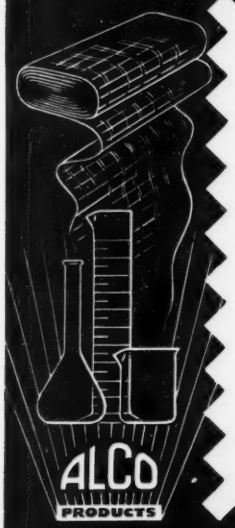

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CHARLOTTE, N.C.

PLASTICIZERS & SOFTENERS (Cont'd)

Dispersing Oil No. 10	lb.	.05½	.05¾
Dutrex B	lb.	.02¾	.03¼
5 and 6	lb.	.020	.031
15E	gal.	.10	.20
20, 21, 22 and 25	lb.	—	.04
ELA	lb.	—	.80
Elastex 10-P	lb.	.40	**.42½**
50-B	lb.	.34½	**.37**
DC-HP	lb.	.42½	**.43½**
Estac	lb.	—	.16
Ethox (dms.)	lb.	.41¾	.42
Flexol B-400	lb.	.27	.29
DHP	lb.	.35	.37½
DOP	lb.	.37	.39½
TOF	lb.	.41¾	.44
3GH	lb.	.42	.44
3GO	lb.	.51¾	.53½
4GO	lb.	.36	.38½
8HP	lb.	.38	.40½
Galex W-100	**lb.**	**.13½**	**.15**
G. B. Light Process Oil	lb.	.025	.0325
G. B. Naphthenic Neutrals	gal.	.11	.18
Good-Rite GP233	gal.	.41½	.44¼
GP261	gal.	.37	.39¾
Harflex 500 (dms.)	lb.	.36½	.39½
Hercolyn (dlvd.)	lb.	.16	.16½
Herron-H.T.	gal.	.16	.27
Herron-Plas	lb.	—	.03¾
Herron-Wax	lb.	.05¼	.06
No. 23	lb.	.08¼	.08½
No. 24	lb.	.07¼	.07¾
HSC No. 13	lb.	.27	.30
Hylene B	lb.	.45	.50
C	lb.	.41	.46
D	lb.	.47½	.52½
Indonex 632½ (633¾, 634½, 638½)	gal.	.1100	.1700
Kapsol	lb.	.35½	.36
Kenflex	lb.	.19	.27
KP 23 (dms.)	lb.	.31½	.32½
70 (dms.)	lb.	.34	.34½
120 (dms.)	lb.	.32½	.38
140 (dms.)	lb.	.45½	.46
150 (dms.)	lb.	.29	.30
201	lb.	.41½	.42
Kremol 40	gal.	.36	.46
50	gal.	.36	.46
Kronisol (drums)	lb.	.35	.35½
Kronitex (drums)	lb.	.31½	.32½
Lanolin, Tech. Anydrous	lb.	.21	.23
Lead Oleate	lb.	—	.30½
Lindol (dms.)	lb.	.34	.35
2-Mercaptoethanol (drums)	lb.	—	.75
Methox (dms.)	lb.	.36½	.37
Methyl Laurate	**lb.**	**.25**	**.27**
Methyl Oleate	lb.	—	.20
Methyl Stearate (dms.)	lb.	—	.30
Modicol G	lb.	—	.23
R	lb.	—	.17
Montan Wax, Crude	lb.	.15	.18
Monten Wax	lb.	.12	.13
Monty Wax	lb.	—	.30½
Morflex No. 100	lb.	.37	.38¾
Natac	lb.	.10	.11
Neolene 210 (t.c.)	lb.	—	.16
212 (t.c.)	lb.	—	.14
220 (t.c.)	lb.	—	.15
Nerium	**lb.**	—	**.09**
Nevillac Resins (dms.)	lb.	.23	.45
Neville Resins (dms.)	**lb.**	**.10½**	**.15½**
Nevindene Resins (dms.)	lb.	**.12½**	**.15½**
Nevinol (dms.)	lb.	—	**.17**
Nevoil	lb.	.02¼	.03¼
Nevtex 10 (dms.)	lb.	.08¾	.10½
Nuba 1 (and 2) (dms.)	**lb.**	—	**.04**
3X (dms.)	lb.	.05¾	.06¾
15 (and 30) Oil (dms.)	lb.	.37½	.39¼
No. 480 Oil Proof Resin	lb.	—	.18
Ohopex Q10 (dms.)	lb.	.36½	.37½
Opalwax	**lb.**	**.37**	**.38**
Ortho-Nitrobiphenyl	lb.	.06	.11
Ozokerite Wax No. 64 White	lb.	.31	.32
Yellow	lb.	.25	.26
P-1 (and 4)	lb.	.41¼	.43
P-4C	lb.	—	.38½
P-8	lb.	—	.28
P-75	lb.	.66	.72
Pale 4 (and 1000)	lb.	.37½	.39¼
Palm Oil	**lb.**	—	**.11**
Paradene Resins (dms.)	lb.	.05	.06
Para Flux (dms.)	gal.	.1825	.1925
2016 (dms.)	gal.	.22	.23
Para Lube (t.c.l.)	lb.	.046	.048
Parmo	lb.	.06	.13¾
Pentor 22	lb.	**.72**	**.75**
PG-16 (drums)	**lb.**	—	**.23½**
Picco 10 (and 25)	lb.	—	.13½
75 (and 100)	lb.	—	.14
Rubber Resin 100	lb.	.1855	.1905
S.O.S.	gal.	—	.29
Piccocizer 30	lb.	—	.05½
Piccolastic A (and B, C, D, E)	lb.	.28½	.29
FF, FHF and FX	lb.	—	.1815
T-135	lb.	.22¼	.23¼
Piccolyte S Resins	lb.	.18¼	.20
Piccolyte WW Resins	**lb.**	**.45**	**.47**
Picconumaron Resins	lb.	.06½	.12
Piccovar	lb.	.14½	.15
Piccovol	lb.	—	.02½
Pictar	gal.	—	.25
Pigmentar	lb.	.0410	.0511

PLASTICIZERS & SOFTENERS (Cont'd)

Pigmentarol	lb.	.0410	.0511
Plastac M	**lb.**	—	**.09½**
Plasticizer 2286	lb.	—	.26¼
Plasticizer SC	lb.	.49	.52
Plasticizer VA-1	lb.	—	.40
Plasticizer W-33	lb.	.37	.38¾
Plasticizer XP-3	**lb.**	—	**.50**
Plastoflex 50	lb.	.26½	.29
52	lb.	.31	.32½
VS	lb.	.40	.42½
Plastogen	gal.	.07¾	.08
Plastolein 9050 (c.l.)	lb.	—	.48
9055	lb.	—	.39
9058	lb.	—	.47
9250	lb.	—	.31
9715	lb.	—	.38
9720	lb.	—	.30½
Plastone	lb.	.27	.30
Polycin 781	lb.	.40	.41
Polymel C-128	lb.	.19½	.20½
D	lb.	.22	.24
H-2	lb.	.22	.24
6	lb.	.06¾	.10
7	gal.	.23	.28
Process Oil C-255 (c.l.)	gal.	—	.22
Propylene Stearate (dms.)	lb.	—	.32
PT 400 Pine tar (600, 800) (t.c., dms.)	lb.	.0410	.0534
PX-104	lb.	.34	.42
PX-108	lb.	.38	.46
PX-208	lb.	.41½	.49
PX-404	lb.	.60	.68
Reogen	lb.	.11¾	.12
465 Resin (drums)	lb.	.05	.05½
Resin 731-C	cwt.	—	13.50
Resin C	lb.	.0200	.0285
Resinex	lb.	.03¼	.03¾
L-4	lb.	.02¼	.03
Rexflex	lb.	—	.15
Rosin Oil	gal.	.54	1.20
R.P.A. No. 2	lb.	—	.65
No. 3	lb.	—	.46
No. 5	lb.	—	.57
R.S.O. Softening Oil	lb.	.03	.05
Rubberol	lb.	—	.25¼
Rubtar	gal.	—	.40
Santicizer B-16	lb.	.50	.52
E-15	lb.	.47	.49
M-17	lb.	.44	.46
No. 107	lb.	.40	.42½
No. 140	lb.	.29	.31
No. 141	lb.	.40	.42½
No. 160	lb.	.34	.36
Sherolatum	lb.	.02¾	.05½
Softener No. 20	**gal.**	.09	.25
Staflex 1XA	lb.	.34	.36
Stanolind Petrolatum	**lb.**	.037	.081
Wax	**lb.**	.25	.30
Staybelite Resin (dms.)	cwt.	—	9.00
Sunny South Burgundy Pitch	**lb.**	.1009	.1054
Sunny South Pine Tar	lb.	.0350	.0473
Sunny South Rosin Oil	gal.	.58	.75
Superla Wax	**lb.**	.25	.30
Syncera Wax	**lb.**	.175	.225
Syn Tac (c.l.)	**gal.**	—	.33
Synthetic Reversant Oil	lb.	—	.16
Tar, Refined	gal.	.12	.17
K-Tarnel NR (t.c.)	lb.	—	.0851
Terpene A	gal.	—	.65
TP-90B	**lb.**	—	**.65**
TP-95	**lb.**	—	**.55**
TP98	lb.	—	.50
Triacetin	lb.	.34	.45
Tricresyl Phosphate	lb.	.30	.32½
Turgum S	lb.	.083¾	.093¾
Vanadiset A	**gal.**	**.13**	**.20**
Vistac No. 1	gal.	1.00	1.16
No. 2 (c.l.)	gal.	1.22	1.26
No. 4 (c.l.)	gal.	1.32	1.36
P	lb.	—	.17
Witresin—Granular	ton	41.00	43.00
Solid	ton	36.00	38.00

PROCESSING AIDS

Castor Oil, Processed (dms.)	lb.	—	.22¼
Refined (drums)	lb.	—	.20½
Castorwax (min. 250 lbs.)	lb.	—	.28½
Dutrex 7	lb.	.12	.20
Millrex	**lb.**	—	**.15**
Resin No. 510	lb.	.13½	.16½
Zyrox	lb.	.50	.79

PROTECTIVE & STABILIZING AGENTS

Acacia	lb.	.12¾	**.21**
Alpha Protein	lb.	.24	.28
Ammonium Alginate	lb.	—	.95
Aroostoocrat	lb.	—	.07½
Carob Bean Flour	lb.	—	.46
Casein	lb.	.28	.38
Ethylene Diamine 68%	**lb.**	.57	**.58**
Karaya Gum	lb.	.20	.50
Prosein	lb.	.0600	.0630
Rex Compound No. 2801	lb.	—	**.15**
Stablex B	lb.	.50	.95
K	lb.	.27	.35
Tragacanth Flakes	lb.	.60	1.35

RECLAIMING AGENTS

Armeens C	lb.	.50	.58
T	**lb.**	**.42**	**.50**
No. 517 H.B. Oil	gal.	.11½	.16½
535	gal.	.22	.27
C-6 Oil (and 28, 32)	gal.	.33	.38
C-10 Oil	gal.	.25	.30
C-33 Oil	gal.	—	.21¼
Caustic Soda—Flake 76% (c.l., drums)	cwt.	—	3.60
Liquid 50% (t.c.)	**cwt.**	—	**2.40**
Solid 76% (c.l., dms.)	cwt.	—	3.20
Cresylic Acid (99-100%)	gal.	1.20	1.39
D-4	gal.	—	.27
F-5	gal.	—	.25
G. B. Reclaiming Oil	gal.	.12	.18
(t.c.)	gal.	—	.12¼
LX-77 Reclaiming Solvent	gal.	.21	.30
LX-572 Reclaiming Oil	gal.	.23	.28
Neo-Fat D-242	**lb.**	**.05½**	**.07¾**
PRR 1	gal.	.15	.35
PT 67 Light pine oil	gal.	.50	.60
PT 101 Pine tar oil	lb.	.0410	.0534
O (d)	gal.	—	.286
Reclaiming Oil 1621	**lb.**	.03	.04
Reclaiming Oil 3186 (t.c.)	gal.	.28	.38½
Reclaiming Oil 3186-G	gal.	.25	.36½
Reclaiming Reagent No. 4	lb.	.12	.15
R.P.A. No. 3	lb.	—	.46
Soda Ash (c.., bags)	**cwt.**	—	**1.40**
Solvent 1 (dms.)	gal.	—	.30
Solvent 534	gal.	.20½	.26½
Solvent Oil 21	gal.	.24	.29
C-42	gal.	.23	.28
Union Solvent 4060-O	gal.	—	.147
X-1 Resinous Oil	lb.	.0190	.0285
X-60 Solvent	**gal.**	**.24**	**.32**

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98	lb.	.0740	.1225
Continental F	lb.	.0740	.1225
Croflex	lb.	.0740	.1225
Crow	lb.	.0740	.1225
Dixiedensed (and S)	lb.	.0740	.1225
Kosmobile (and S)	lb.	.0740	.1225
Kosmos T	lb.	.0740	.1225
Micronex HPC	lb.	.0740	.1225
Spheron 4	lb.	.0740	.1225
Witco Disperso No. 6	lb.	.0740	.1225

Channel, Medium Processing (MPC) (bags)

Atlantic MPC-95	lb.	.0740	.1225
Continental A	lb.	.0740	.1225
Croflex TH	lb.	.0740	.1225
Dixie R-1	lb.	.0740	.1225
Dixiedensed HM (and S-66)	lb.	.0740	.1225
Huber Arrow TX	lb.	.0740	.1225
Kosmobile HM (and S-66)	lb.	.0740	.1225
Kosmos M	lb.	.0740	.1225
Micronex Standard	lb.	.0740	.1225
Spheron 6	lb.	.0740	.1225
Texas M	lb.	.0740	.1225
Witco Disperso No. 1	lb.	.0740	.1225

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42	lb.	.0740	.1225
Continental AA	lb.	.0740	.1225
Croflex 77	lb.	.0740	.1225
Dixiedensed 77	lb.	.0740	.1225
Kosmobile 77	lb.	.0740	.1225
Micronex W-6	lb.	.0740	.1225
Spheron 9	lb.	.0740	.1225
Texas E	lb.	.0740	.1225
Witco Disperso No. 12	lb.	.0740	.1225
Wyex	lb.	.0740	.1225

Channel, Conductive (CC) (bags)

Dixie 5 Dustless	lb.	.0868	.1425
Kosmink dustless	lb.	.0868	.1425
Spheron C	lb.	.1400	.1850
Spheron N	lb.	.2500	.3000
Voltex	lb.	.1800	.2150

Furnace, Fast Extruding (FEF) (bags)

Dixie 50	lb.	.0600	.1000
Kosmos 50	lb.	.0600	.1000
Statex M	lb.	.0600	.1000
Sterling SO	lb.	.0600	.1000

Furnace, High Modulus (HMF) (bags)

Continex HMF	lb.	.0525	.0975
Dixie 40	lb.	.0550	.0950
Kosmos 40	lb.	.0550	.0950
Modulex	lb.	.0550	.0950
Statex 93	lb.	.0550	.0950
Sterling L	lb.	.0550	.0950

Furnace, Medium Abrasion (MAF) (bags)

Philblack A	lb.	.0600	.1000

Furnace, Reinforcing (RF) (bags)

Dixie 60	lb.	.0790	.1175
Kosmos 60	lb.	.0790	.1175

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF	lb.	.0400	.0800
Dixie 20	lb.	.0400	.0800
Essex	lb.	.0400	.0800
Furnex	lb.	.0400	.0800
Gastex	lb.	.0400	.0800
Kosmos 20	lb.	.0400	.0800
Pelletex	lb.	.0400	.0800
Sterling NS	lb.	.0400	.0800
Sterling R	lb.	.0400	.0800
Sterling S	lb.	.0400	.0800

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It may be your type of manufacture has not required the use of treated liners. However, liners eventually have to be replaced.

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Furnace, Fine (FF) (bags)

Statex B	lb.	.0650 -	.1050
Sterling 99	lb.	.0600 -	.1050

Furnace, High Abrasion (HAF) (bags)

Aromex	lb.	.0790 -	.1250
Philblack O	lb.	.0790 -	.1190
Statex R	lb.	.0790 -	.1250
Vulcan 3	lb.	.0790 -	.1220

Furnace, Very Fine (VFF) (bags)

Statex K	lb.	.0790 -	.1250

Thermal, Fine (FT) bags)

P-33 (c.l.)	lb.	— -	.0500

Thermal, Medium (MT) (bags)

Thermax (c.l.)	lb.	— -	.0325
Thermax, Stainless (c.l.)	lb.	— -	.0400

REINFORCING AGENTS—SILICA

Hi-Sil	lb.	.11 -	.12½

REINFORCING AGENTS—MISCELLANEOUS

Darex Copolymer No. 3	lb.	.42 -	.44
X34	lb.	.37 -	.39
X43 (and 43E)	lb.	.38 -	.40
Darex Copolymer Latex No. 3 (and X34)	lb.	**.36½ -**	.50
Durex 12687 (and 12707)	lb.	— -	.32
Durex 13355	lb.	— -	.26
Good-Rite Resin 50	lb.	.36 -	.38
Kralac A	lb.	.39 -	.40
Marbon S and S-1	lb.	.41 -	.48
8000	lb.	.41 -	.48
Marmix	lb.	.41 -	.48
Pliolite Latex 190	lb.	.30 -	.34
Pliolite NR	lb.	.74 -	.76
Pliolite S6 (and S6B) Resin	lb.	.36 -	.37
C-3 Masterbatch	lb.	.47 -	.48
C-4 Masterbatch	lb.	.45 -	.46
G Masterbatch	lb.	.35 -	.36
G50 Masterbatch	lb.	.35 -	.36
N Masterbatch	lb.	.40 -	.41
R Masterbatch	lb.	.43 -	.44
Polyco 220	lb.	.13 -	.15

RETARDERS

Dutch Boy Normasal	lb.	— -	.47¼
ESEN	lb.	— -	.36
Retarder ASA	lb.	— -	.55
Retarder PD	lb.	.34 -	.36
Retarder W	lb.	— -	.43
Retardex	lb.	.47 -	.50

RUBBER SUBSTITUTES

Mineral Rubber

38	ton	38.00 -	40.00
Black Diamond	ton	38.00 -	40.00
Byerlyte	ton	47.00 -	54.00
Gilsonite, Selects (c.l.)	ton	33.50 -	36.00
Hard Hydrocarbon (dms.)	ton	42.50 -	44.50
Herron Flake	ton	— -	45.00
Mineral Rubber, solid	ton	42.50 -	44.50
Pioneer	ton	35.00 -	46.00

Vulcanized Vegetable Oils (Factice)

Amberex	lb.	.28 -	.32
Brown	lb.	.1310 -	.1955
Dispersed	lb.	.22 -	.42
Neophax	lb.	.16 -	.24
White	lb.	.13 -	.24

Miscellaneous Rubber Substitutes

G.B. Asphaltenes	lb.	.06 -	.06½
Gilsowax B	lb.	.09 -	.11
Resin No. 1098 (drums)	lb.	— -	.62
No. 1198	lb.	.46¾ -	.49¾

SOLVENTS

Acetone (dlvd.)	lb.	.08½ -	.11
American Dipentine	gal.	.47 -	.50
American Pine Oil	gal.	.75½ -	.76½
Amsco Lactol Spirits (t.c.)	gal.	— -	.17
Rubber Solvent (t.c.)	gal.	— -	.16
Solv A (t.c.)	gal.	— -	.21½
Solv A-80 (t.c.)	gal.	— -	.26
Solv B (t.c.)	gal.	— -	.25
Solv B-90 (t.c.)	gal.	— -	.28½
Solv D (t.c.)	gal.	— -	.25¾
Special Naphthalite (t.c.)	gal.	— -	.16
Textile Spirits (t.c.)	gal.	— -	.17
Amyl Chlorides, Mixed (t.c.l.)	drums	lb. .10 -	.11
Aromatic Solvent 40	gal.	— -	.219
Benzol 90%	gal.	.17 -	.24
Butyl Acetate (t.c.)	lb.	.13 -	.175
Butyl Alcohol (t.c.)	lb.	.13 -	.175
Secondary (dlvd.)	lb.	.11 -	.135½
Tertiary (dlvd.)	lb.	.12 -	.14½
Carbon Bisulfide, Tech.	lb.	.0440 -	.0800
Carbon Tetrachloride	lb.	.08 -	.08½
Cosol 1	gal.	**.30 -**	.38
Cosol 2	gal.	**.30 -**	.38
Cyclohexane	lb.	.09¼ -	.11¾
Cyclohexanone	lb.	**.25 -**	.27 *
Diacetone, Pure (dlvd.)	lb.	.12 -	.14½

SOLVENTS (Cont'd)

Dichlorethyl Ether (dms.)	lb.	**.165 -**	**.17**
Formal (dms.)	lb.	**.265 -**	**.27**
Dichloropentane (t.c.l.)	lb.	.04 -	.07
Dicom	gal.	.30 -	.42
Dipentene 122 (dms.)	gal.	**.35 -**	**.36**
Halowax Oil	lb.	**.25 -**	**.37**
Heptanes (t.c.)	gal.	.17 -	.22
Hexalin Cyclohexanol	lb.	.20 -	.22 *
Hexanes (t.c.)	gal.	.17 -	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.47 -	.64
Ether, Ref. (dlvd.)	gal.	.05 -	.07½
Mesityl Oxide (dlvd.)	lb.	.11½ -	.14
Methyl Acetone, Syn. (drums, dlvd.)	gal.	**.615 -**	**.65**
Methyl Ethyl Ketone	lb.	.11 -	.13½
Methyl Isobutyl Ketone (dlvd.)	lb.	.13 -	.15½
N-5 Pentane Mix. (t.c.)	gal.	— -	.13½
N-6 Hexanes (t.c.)	gal.	— -	**.14**
N-7 Hexanes (t.c.)	gal.	— -	**.13**
Petrolene (t.c.)	gal.	— -	.13125
Picolines, Alpha, Refined	lb.	— -	.40
Mixed	lb.	— -	.30
Proprietary Alcohol (t.c.)	gal.	— -	**.43½**
Pyridine, Refined	lb.	— -	1.05
Quinoline	lb.	— -	.61¼
Rubber Solvent (t.c.)	gal.	— -	.16
Rubsol (t.c.)	gal.	— -	.11875
Skellysolve B (Hexanes) (t.c.)	gal.	— -	.148
C (Heptanes) (t.c.)	gal.	— -	.141
E (Octanes) (t.c.)	gal.	— -	.155
R (Solvent Naphtha)	gal.	— -	.114
Solvenol (dms.)	gal.	— -	**.36**
Solvent, Crude, Light	gal.	.19 -	.28
Sovasso 100 (t.c.)	gal.	— -	.28
150 (t.c.)	gal.	— -	.28
Sunny South Dipentine	gal.	.47 -	.50
Sunny South Pine Oil	gal.	.75½ -	.76½
Toluene (drums)	gal.	— -	.28
Toluol (t.c.)	gal.	— -	**.30**
Trichlorethane	lb.	.11 -	.12
Triglycol Dichloride (dms.)	lb.	.53 -	.54
Tromex	lb.	**.078 -**	.083
Union Thinner 1	gal.	— -	.161
3	gal.	— -	.161
7	gal.	— -	.151
2-50-W Hi-Flash	gal.	— -	.38
X-7 Sp. Heptanes (t.c.)	gal.	— -	.11

STABILIZING AGENTS (for Vinyl Resins)

Basic Silicate White Lead	lb.	.16¼ -	.17¼
No. 201	lb.	.21¼ -	.22¼
BVS	lb.	— -	.60
Cadmium Stearate	lb.	— -	1.25
Dutch Boy DS-207	lb.	— -	.58
Plumb-O-Sil A	lb.	— -	.30¼
B	lb.	— -	.31¾
Tribase	lb.	— -	.27½
Dythal	lb.	— -	.42½
Lead Stearate, Precip.	lb.	.36 -	.38
Fused	lb.	— -	.35½
Lithium Stearate	lb.	.63 -	.65
Stabelan E	lb.	1.25 -	1.40
XL	lb.	**.55 -**	**.65**
Stabilizer No. 3	lb.	— -	2.00
Stabilizer No. 21	lb.	— -	.90
Stabilizer No. 52	lb.	— -	2.00
Stabilizer E6B	lb.	— -	.85
Stabilizer JCX	lb.	— -	.49
Stabilizer L	lb.	— -	.60
Stabilizer SN	lb.	— -	.42
Stabilizer V-1-N	lb.	— -	.50
Stabilizer V-9	lb.	— -	.85
Stabilizer V-7939	lb.	— -	.60
Vanstay	lb.	**.33 -**	.35

STIFFENING AGENTS

Calco S. A.	lb.	.80 -	.83

SUN CHECKING AGENTS

Antisol	lb.	— -	.23
Antisun	lb.	— -	.21
Heliozone	lb.	**.25 -**	.26
Sharples Wax	lb.	.23 -	.28
Sunolite	lb.	.20 -	.23
Sunproof	lb.	.25 -	.26
Imp.	lb.	.23 -	.24
Jr.	lb.	.18 -	.19
Tonox	lb.	.50 -	.52

TACKIFIERS

Advaresin 100	lb.	.13½ -	.14
Arcco 493-49B	lb.	.15 -	.17
700-25A	lb.	.14 -	.16
U2-24	lb.	.11 -	.13
Galex (drums)	lb.	— -	**.15**
Indopol H-300 (bbls.)	gal.	1.12 -	1.16
Koresin	lb.	.73 -	.75
Liquid Rubber Flux	lb.	— -	.14
Nilox	cwt.	12.50 -	13.50
Pentalyn A (dlvd.)	lb.	.12½ -	.13
Resin V	lb.	— -	.23¼
Rubtack	lb.	— -	.12
Staybelite Ester No. 10 (dlvd.)	lb.	.19¾ -	.20¼
Synthol		— -	.21¼
Vistac No. 1	gal.	1.00 -	1.16
No. 2 (c.l.)	gal.	1.22 -	1.26
No. 4 (c.l.)	gal.	1.32 -	1.36
A	lb.	— -	.20¼
Zirex	cwt.	12.00 -	12.80

THICKENERS (FOR LATEX)

Alcogum AN-6	lb.	— -	.08
AN-10	lb.	— -	.08½
Betanol (drums)	lb.	— -	.70
Emulsorex No. 5	lb.	— -	**.35**
Lecithin	lb.	**.12 -**	**.17**
Modicol VD	lb.	— -	.12½
VE	lb.	— -	.10⅞
VF	lb.	— -	.10⅞
VK	lb.	— -	.07
Polyco 296	lb.	.13 -	.13½
Propylene Laurate (dms.)	lb.	.57 -	.67
Sodium Silicate	cwt.	1.50 -	2.65

VULCANIZING AGENTS

Selenium

Ancasal*	lb.	— -	2.00
Vandex	lb.	— -	2.25

Sulfur

Blackbird	cwt.	— -	**2.30**
Crystex	lb.	.19½ -	.23
Darex Dispersed Sulphur	lb.	.12 -	.17
Dispersed Sulfur	lb.	.12 -	.17
Devil (c.l.)	cwt.	— -	**1.75**
Insoluble Sulfur 60	lb.	.12½ -	.13
Spider	cwt.	— -	**2.30**
Star (c.l.)	cwt.	— -	**2.25**
Tire (c.l.)	cwt.	— -	1.75
Tube	cwt.	— -	2.25

Tellurium

Ancatel*	lb.	— -	2.00
Latex Telloy	lb.	— -	2.00
Telloy	lb	— -	2.00

WASHING & FINISHING AGENTS

Apcolene (t.c.)	gal.	— -	.12375

WETTING AGENTS

Advawet No. 10	lb.	— -	.35
No. 15	lb.	— -	.20½
No. 33	lb.	— -	.39
Aerosol OT 70% Clear	lb.	.80 -	1.00
Alrosol (dms.)	lb.	— -	.40
Alrosperse	lb.	— -	.18
Aquarex D	lb.	— -	.80
MDL Paste	lb.	— -	.33
ME	lb.	— -	.97
NS	lb.	— -	.60
WA Paste	lb.	— -	.28
Areskap 50	lb.	.30 -	.38
Dry 100	lb.	.60 -	.72
Aresket 240	lb.	.30 -	**.38**
Dry 300	lb.	.60 -	**.72**
Aresklene 375	lb.	.42 -	.57
Dry 400	lb.	.70 -	.84
Armaco	lb.	**.29 -**	**.76**
Arquads	lb.	.21 -	.61
Etho-chemicals	lb.	**.34 -**	**.80**
Lecithin	lb.	.18 -	.26
Modicol L	lb.	— -	.58
N	lb.	— -	.40
S	lb.	— -	.22
Nopco 1086-A	lb.	.42 -	.50
1187-X	lb.	— -	.14½
Parnol	lb.	.13 -	.18
Santomerse D	lb.	.44 -	.65
S	lb.	.13 -	.25
Sorbit P	lb.	— -	.25
Stablex G	lb.	.50 -	.70
Tergitol 4 (dms., dlvd.)	lb.	— -	.30
7 (dms., dlvd.)	lb.	— -	.37
O8 (dms., dlvd.)	lb.	— -	.30
P28 (dms., dlvd.)	lb.	— -	.19
Trenamine W-30	lb.	— -	.15
Vultamol	lb.	— -	.17½
Wetsit Conc.	lb.	.25 -	.32

MISCELLANEOUS CHEMICALS

Acto 450 (550-W, 600, 630)	lb.	.109 -	.145
Agchem SA-17	lb.	— -	**.29**
Aquarex SMO	lb.	— -	.50
A.S.T.M. Oil No. 1 (and No. 3)	gal.	1.00 -	1.15
Copper Inhibitor X-872-L	lb.	— -	1.95
D-Tac	lb.	.21 -	.23
2-Ethylhexanol (dms.)	lb.	.25 -	.26
Glycerine, 88% Sap., Crude (dlvd.)	lb.	.25 -	.25½
MODX	lb.	.295 -	.345
NBC	lb.	— -	1.50
Para Resin No. 2457 (c.l.)	lb.	— -	.04
No. 2718 (c.l.)	lb.	— -	**.04**
Pigmented Filmite	lb.	— -	.16½
Polyvinyl Methyl Ether	lb.	— -	1.00
Reference Fluid SR-6	gal.	.85 -	1.00
SR-10	gal.	.60 -	.75
Resin No. 1226	lb.	**.31½ -**	**.36¼**
Rio Resin	lb.	.52 -	.54
RR-10	lb.	— -	.35
Santocel	lb.	— -	**.50**
Sherosope L, N, F-445 and P	lb.	.12½ -	.15
Suhlac B2	lb.	.26 -	.28
PX-5	lb.	.26 -	.28
Synpep N (drums)	lb.	— -	**.54**
Thiokol LP-2	lb.	— -	**.90**
LP-3	lb.	— -	.90
Tysonite	lb.	**.21½ -**	**.22¼**
Vanfre	gal.	2.00 -	2.50
Vinsol Resin—Lumps	cwt.	— -	3.25

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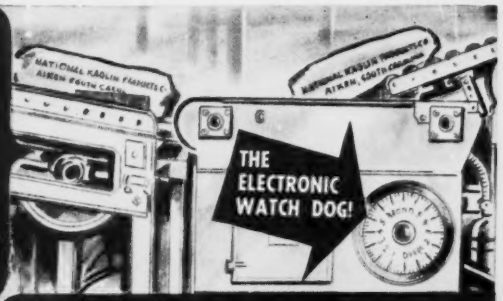

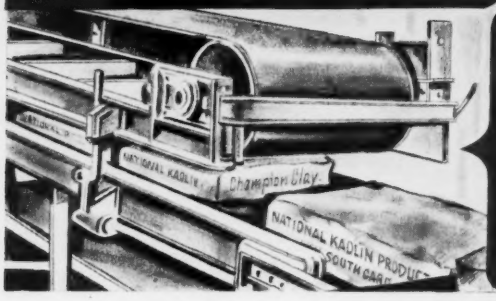

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